CACTUS AND SUCCULENT JOURNAL

Of the Cactus And Succulent Society Of America

Vol. XXIV MAR.-APR., 1952 No. 2

FIG. 14. *Pachyphytum bracteosum* flowers nat. size.

CACTUS AND SUCCULENT JOURNAL

Published and owned by the Cactus and Succulent Society of America, Inc., 132 W. Union St., Pasadena, Calif. A magazine to promote the Society and devoted to Cacti and Succulents for the dissemination of knowledge and the recording of hitherto unpublished data in order that the culture and study of these particular plants may attain the popularity which is justly theirs. North and South America $3.00 per year; foreign $3.50 by money order. Mail application to SCOTT HASELTON, Editor, 132 West Union Street, Pasadena 1, California. *Editorial Staff:* THE ENTIRE SOCIETY. Entered as Second Class Matter at Pasadena, Calif., under act of March 3, 1879. Published bi-monthly. We reserve the right to accept or reject advertising or articles sent to this JOURNAL.

Vol. XXIV MARCH-APRIL, 1952 (PRICE 50c) No. 2

OFFICERS OF THE MIDWEST SOCIETY

President, Mr. John Rodgers, Lorain, Ohio; *First Vice-President,* Mr. Geo. E. Steward, Garfield Heights, Ohio; *Second Vice-President,* Mr. E. J. Fish, Strongsville, Ohio; *Secretary-Treasurer,* Mr. Wm. F. Weber, Box 392, Middlefield, Ohio.

The Society has a membership of twenty with an average attendance of fourteen. The distance between some of the members is over 100 miles.

NEW WAY TO GROW SEEDLINGS

Guy Quinn reports a natural way to grow cacti from seed. In March he broadcast $3 worth of seeds on a rocky hillside just before a rain. In the fall he collected and sold over $200 worth of seedlings of Astrophytums, Cereus, Ferocactus and other kinds. He also took a flower stalk of Agave americana and beat the seeds out by hitting it along the ground on this same hillside with the results of plants so thick that one could not walk without tramping on the seedlings. All you need to raise seedlings this way is a hillside from Olden, Texas, plant the seeds and come back next year and pick up the plants.

A CALIFORNIA COLLECTION

I have a collection of 300 plants in an unheated greenhouse. I give my cacti plenty of ventilation and water according to our weather. The soil that I use comes from under an old cypress hedge along our house and all my plants thrive in it. I would like to contact any member in this area who might like to form a local club.

MRS. JOSEPH CRUZ
2316 Alliance Rd., Arcata, Calif.

EXOTIC FOLIAGE PLANTS FOR MODERN INTERIORS, by Ladislaus Cutak, is a new 24-page Bulletin of the Missouri Botanical Garden published to furnish information on exotic foliage plants for the home, office and factory. Seven illustrations show where plants can be grown indoors. There are chapters on suitable tropical plants such as aroids, figs, crotons, coniferous evergreens, amaryllids, begonias, ferns, palms and cycads, bromeliads, cacti and succulents. Only a limited number of Bulletins are available, so if any of our readers are interested, send for it immediately. The Bulletin (December, 1951, issue) sells for 25c and can be bought at the Main Gate Office, or it can be procured through the mails. Send your remittance to the Librarian, Missouri Botanical Garden, 2315 Tower Grove Ave., St. Louis 10, Mo.

FROM ENGLAND

I collect all kinds of Xerophytic plants and have about 500 species but I am especially fond of the highly succulent, stemless Mesembs. I have 50 *Conophytum* species, 32 *Lithops* and 12 *Argyroderma* species. I will be glad to supply an article with photographs on these plants next autumn.

For the past two years I have been experimenting with trying to grow my plants under something like their natural conditions in varied beds of sandy soil and rocks—in the greenhouse, of course. I have had surprising results for England. For instance, nearly all my Mammillarias and Coryphanthas have been forming copious new wool since November; *Opuntia leucotricha* has been in flower continuously since August. Plants such as *Coryphantha, Stenocactus, Dolichothele Neobesseya* and *Lophophora* withdraw themselves deeply into the soil as Autumn approaches; *Stenocactus* becomes level with the soil surface. New shoots slowly form on *Aporocactus* through the winter. Roots of a 3½ in. *Astrophytum capricorne* were found 2 ft. from the plant. *Rebutia violaciflora* and *Mam. echinata* have been showing flower buds two months earlier than usual. These things just did not happen when they were kept in pots on the dry side during winter.

The cactus bed has soil 30 in. deep and I water it about six times a year starting in early April and ceasing in mid-August. I have smaller beds for Mesembs. and Euphorbias, etc. I keep my plants at an absolute minimum of 45° but most of the time it is between 55-65° in the winter and 70-90° in summer. I have tried keeping them cooler but find I do not get good results or flowers.

I would be glad to exchange correspondence and plants with any other member. W. H. F. RICHARDS, The Brias, 103 Wilbury Rd., Letchworth, Herts., England. (Jan., 1952.)

FIG. 15. *Cotyledon Pillansi* Schönl. approx. x 0.4

COTYLEDON PILLANSI

By J. R. BROWN

Cotyledon Pillansi Schönl. in Rec. Albany Mus. II (1907) 152 & III (1915) 142; Poelln. in Fedde, Repert. XLII (1937) 38. *Cotyledon cuneata* Harv. in Harv. & Sonder, Fl. Caps. II (1862) 373.

This Cotyledon belongs to the group *Pillansi* of

FIG. 16. *Cotyledon Pillansi* Schönl. flowers nat. size.

Schönland. The characters of which are: Somewhat shrubby mostly robust plants resembling the *Orbiculata* group in habit. Lobes of the corolla usually longer than the tube. Flowers (and frequently other parts) glandular-pubescent. Filaments with a tuft of hairs above the base where they join the corolla.

Cotyledon Pillansi like many of the Cotyledons is more or less variable in its characters, the leaves may be green to gray-green in color, quite pubescent to almost smooth, and there may also be variation in the length of the corolla tube, length of the lobes, etc.

The leaves in opposite pairs are 7-10 cm. long, 5-8 cm. broad, more or less obovate to obovate-oblong, with red margins which are more or less wavy in the upper part, the tips obtuse or shortly pointed.

The upper part of the flower stem is especially glandular-hairy, also the pedicels, calyx, and the outer surface of the corolla. The flowers are greenish-yellow in color with narrow corolla lobes which are usually twice the length of the 3-6 mm. long, ovate, calyx segments.

Distributed from Namaqualand through the Western Karroo to Biesjespoort; Oudtshoorn.

The other South African spp. of Cotyledon included in this group are *C. Deasii* Schönl., *C. Wickensii* Schönl., and *C. teretifolia* Thunb., the latter being a well known plant in many succulent plant gardens.

The plant of this Cotyledon which is illustrated here has handsome pale, almost glabrous, gray-green leaves, beautifully margined dark red and distinctly pointed, the upper margins also lightly crispate. While the flowers are not too colorful they are very interesting, very sticky and of a distinct shape from those of the more commonly known Cotyledons in our gardens. The flowers which are shown nat. size would seem to be much larger than is indicated for this plant and whether this is the result of its growth in cultivation is a matter difficult to decide. One of the corollas was cut open, hoping to show the hairs on the lower part of the filaments. These, however, are extremely fine and downy, and while filling the throat of the tube, are scarcely visible in the illustration.

The flowering period is May-June-July in Southern California.

PACHYPHYTUM BRACTEOSUM

Pachyphytum bracteosum Link, Klotzsch & Otto. This is the type species of the genus and was named as long ago as 1841 and is quite well known to succulent gardeners today, being very adaptable as a pot plant ,or where climate will permit, making a beautiful and picturesque plant in the open garden. The botanical aspect of this Pachyphytum has been well discussed by Eric Walther in this JOURNAL, vol. 3 (1931), and need not be repeated here.

The accompanying photograph shows a very old plant of this Pachyphytum which has been

FIG. 17. *Pachyphytum bracteosum* Link, Klotzsch & Otto. Approx. x 0.2

allowed to grow in a natural way and is approximately 30 inches in diameter. Note the sturdy stems supporting the lovely rosettes of grayish-white leaves.

At times the leaves may be tinged reddish-purple at the tips, and at times in the case of pot grown plants the leaves may be of a bluish-purple color. This leaf color would seem to depend on the season of the year, the vigor of the plant and how it is grown.

FROM NEW ZEALAND

You may be interested to learn that our old friend Mrs. Waterman of Auckland, New Zealand, is still going strong. She still has an amazing collection of cacti and succulents though her main love now is Bromeliads. With several cows, about 150 bantams, a large collection of postage stamps, and a couple of grandchildren she has very little spare time. The journey from her front gate is as difficult as an army assault course. In fact it has become necessary to saw away the spikes on an assortment of Agaves lest she find the postman run through. A. B. CUTLER.

JAPAN DEALER

A new price list of cacti and succulents has just been received from Japan. It is printed in English. One of the best features of this list is that the size of plants is indicated—an example that some of our U.S. dealers might follow. Send for free list to Kyorakuen Nursery Co., 2301 Tujido, Fujisawa-shi, Kanagawa-ken, Japan.

ON THE PHILOSOPHICAL APPROACH TO TAXONOMY

The only reason for giving plants names, outside of convenience, is to establish their natural relationships. There is always much discussion among botanists about what constitutes an acceptable measure of difference by which a new genus may be set up or a new species described.

Science is concerned only with the truth, not necessarily with the facts, for facts are only a part of the truth. Truth however, as far as we human beings are concerned, is always relative to the known facts. None of the natural sciences are exact, for who shall say when we have all the facts at hand. In mathematics 2 plus 2 always adds up to 4 but the botanist has a more complex problem.

When a taxonomist considers the relationships of a plant there are two fundamental methods of approach. He may search for all the differences he can find that set his plant off from others that are obviously of the same group. Or he may search for all the things wherein his plant agrees with the others. It is in this choice of methods that the arguments start. Really, of course, both methods are used in conjunction: we search for the likenesses to place our plant and then for the differences that set it apart, but the stress we place on either of the methods causes the divergence of opinion.

Basically there are no accurate measures of determining the importance of plant differences. If it were that simple the fun would go out of it. However, we can be guided by the present commonly accepted standards in related fields. These standards of acceptance are not immutable but change to a degree like fashions. A great teacher in a university will inevitably attract and influence the top students of his specialty and ten or twenty years thereafter standards may change as the younger workers' influence is felt. However, throughout the field of botany those men with the most secure reputations have been and are on the conservative side. They are the workers who attach more significance to likeness than to difference. The weight of evidence seems to be on their side for no two living things are ever identical. Ecological influences may make vast changes in the individual but none at all on the hereditary factors and it is only these factors, those that a living thing passes on to its progeny, that have meaning for the taxonomist.

To paraphrase a wise old saying, "A taxonomist is known by his works." His reputation and standing is built upon the amount of acceptance of his work by other qualified workers in his field. Time has a way of settling things, of burning away the dross and leaving only the solid accomplishment for posterity.

HARRY JOHNSON

A NEW BOOK

Poisonous Dwellers of the Desert—Dodge. A fascinating booklet well illustrated, 50c postpaid. The following is quoted from this 44 page book:

"Dr. Forrest Shreve of the Desert Laboratories in Tucson, Arizona, states that the principal characteristic of a desert is 'deficient and uncertain rainfall.' From our grammar school geographies, we gained the impression that a desert is a great expanse of sand piled into dunes by the wind, without moisture or vegetation, a land of thirst, desolation, even death.

"Although sand dunes devoid of vegetation are characersitic of the Sahara and some other deserts of the world, those of the United States support a variety of plant and animal life which, through generations of adaptation, are able to meet the conditions imposed by this environment (see frontispiece). Persons who misunderstand our deserts fear them, while others who have visited them become fascinated and return to them periodically or settle down and live in them.

"Some of the creatures living in deserts are known to be poisonous to man. Western thriller fiction of press and screen has emphasized and exaggerated this fact, developing in many people a wholly mistaken fear of the desert and its inhabitants. In contrast, other persons may underestimate the possibility of injury from these animals and become careless.

"It is the purpose of this booklet to discuss accurately the various poisonous dwellers of the desert, as well as to debunk some of the superstitions and misunderstandings which have been built up about several harmless creatures."

"CACTI"—by Bertrand and Guillaumin

The English edition of this French book is now available. Contains fine illustrations, many in color, of the cacti usually found in collections. Packed with cultural information and helpful suggestions for the amateur. Postpaid $2.00 in U.S.A.

Abbey Garden Press, 132 W. Union St., Pasadena, Calif.

MOORTENS RETURN FROM RUGGED 5000-MILE TRIP

The Moorten family, consisting of "Cactus" Slim, Patricia and eight-year-old son, Clark, have returned to Palm Springs from their greatest adventure trip all the way down the peninsula of Baja California, Mexico, to the southern tip, Cape San Lucas—and back.

"The road is so rough and difficult that this is an accomplishment very few people ever experience. However, it's the only way to really see all the country —and that's exactly why we went. One has to have extreme fortitude and be well prepared to even attempt that trip because both traveler and vehicle take a terrific beating," said Moorten.

The Moortens spent eight weeks on the trip traveling over five thousand miles in their specially built and equipped truck. They camped out all the way and carried quantities of supplies, which incidently, enabled them upon several occasions to be of assistance to the native folks along the way.

They visited ranches, missions, pearling camps, mines, natural tropical gardens, oasis towns, cactus jungles and fishing ports. They collected rare plants, minerals, woods, shells, curios and pictures—several hundred color pictures to be able to show everyone when telling their story of the picturesque places, wonderful people and fantastic plants which inhabit that remote region.

CORYPHANTHA WERDERMANNII AND THE ESTANQUE DE JABALI

By FRITZ SCHWARZ

Translated by JOHN POINDEXTER

As we stood on a rocky ridge in the driest sierra of southwestern Coahuila we saw stretched out below us one of the many broad highland valleys which characterize the northern provinces of Mexico. Gray monotony and a feeling of timelessness gave us an impression that here is a sanctuary against worldly troubles. Even though Autumn was drawing its mark across the land, and the foliage was showing signs of changing color, there was a hot sparkle across the floor of the valley that spoke clearly of mid-summer in the desert.

For weeks we had wandered through this barren, dry range of mountains skirting the occasional clumps of yucca, which defy the extremes of climate in their own bizarre fashion, and which forced us to detour through heavily armed thickets of opuntias or against the long spined mesquites. We had been searching for *Coryphantha werdermannii*. Thus far all attempts to locate this extraordinary plant had failed. Although we were all aware of this, we were certain that the plant would be found sooner or later, and we still hoped that we might find it on this trip, although our stocks of food and water were running perilously low.

A small but sharply outlined dust cloud moved across the blue-gray floor of the valley. There was no wind, so my companion and I watched this flying gray cloud intently, trying to determine the cause of the dust. We began the slow descent into the valley, still watching the dust cloud, which was moving our way.

"Look there, Fritz, an antelope," my friend spoke suddenly. Now we could recognize the fleeing creature and, a short distance behind it, a gray shape that steadily overtook it.

"A wolf," I shouted. While I took the rifle out of the pack, I gave my friend to understand that he was to follow with the burros.

"Maybe we will have a fresh roast tonight," I shouted, then raced down the steep slope toward the valley floor. Fatigue finally forced me to slow my breakneck course. At this moment the wolf glided to the side of the antelope. He sailed through the air, and then, with death riding on its shoulder, the antelope ran its last race. It was only possible for the mortally wounded beast to carry his fearful rider for a few yards before it collapsed. The racing dust cloud stopped and was gradually dissipated.

By this time I had almost reached the floor of the valley, but the distance was still too great for shooting. While I ran my lungs out, the wolf was eating the flesh that I had marked as ours. Finally I got within range. Slowly I aimed and fired. But the crazy race had exhausted me, and I missed several shots, while the wolf calmly continued to feed on the carcass of the antelope. I was too tired to give up. One more time I aimed the rifle very carefully and pulled the trigger. A loud click announced that there were no more cartridges in the chamber and the magazine was empty. There was nothing to do but to run some more, and it was no pleasant task on that rough ground. A few times I stumbled and almost fell flat, but finally I reached a point only about a dozen paces from the wolf. I approached him cautiously, with drawn revolver. Now I am only ten steps from him. He tugged again at his victim, then realizing that it was too large to carry away, he rushed at me with a fearful growl.

I shot four times, but the wolf would not be stopped. The wounded creature is only two steps away, then he leaped at me. By this time the beast was so close that my last shot went directly into the wolf's slavering throat. Though dead, he still struck me before falling to the ground. While the last shot echoed through the mountains the glare of hate gradually faded from his eyes. Slowly, I seated myself beside this mighty warrior. Even after being severely wounded he had almost succeeded in tearing my side. A shudder crept over me, and my knees trembled from the excitement of this last moment, and from the long race.

After a few moments I went to salvage what meat I could from the antelope. Meanwhile my friend arrived with the burros. He congratulated me in a laconic manner.

"You were lucky. Only your last shot in his throat saved your life," he said.

We camped here, cut the antelope in strips and dried them on the hot stones. It was afternoon the following day before we broke camp. On the far side of the endless plain, which extends to the horizon, hills shimmer in the glaring sunlight. We headed for them. The sun was still near the zenith, and it hurled its destructive rays at us with unabated force. After what seemed an eternity, we finally reached and crossed the range of red-brown hills. Our practiced eyes swept the terrain, but *Coryphantha werdermannii* was not to be found. We wondered if we would ever find it. By evening we had finally reached the Estanque de Jabali (Jabali Pool), one of the few water holes in this dry range of mountains. We made our camp there.

Several days went by, days filled with hardship and deprivation. During this time our water hole had almost dried up, and we realized that soon we must move on, for the next water hole is a considerable distance away. We had wandered over the flat and endless hills in all directions, and though we had extended the search a considerable distance from the water hole, we still had not located any coryphanthas. The constant heat and thirst stifled our spirits, and the sweat had eaten away our clothing from our wasting bodies. Still, in all things that men do, there is a certain determination pushing them on, and so it was with me. It was as though death stared me in the face, and yet as I looked at the brown hills to the northeast, something drew me to them.

"We will look one more time in that direction." My comrade nodded silently as his eyes followed my gaze.

As we approached the line of hills I heard my friend's voice.

"Tomorrow we must start back or we will die of thirst." I only nodded. What could I say? I knew the danger we were in even better than he did.

We often passed extensive thickets of *Opuntia microdaysis* var. *rufida*, and *Grusonia cereiformis* which were in a singularly healthy condition. However, we could not discern any other changes in the vegetation. In endless monotony we proceeded, hour after hour, and in spite of the danger of thirst, led by our tenacious will and a hope. As far as the eye could see there was not the faintest sign of a shadow. The hill reared above us and seemed to glow with an everlasting heat. Suddenly we were re-born. Even my comrade had noticed something new, which gleamed before us with a different shade of red from the remainder of the landscape. Both of us ran toward it, and finally we reached it.

"Ah," shouted my comrade in happy excitement.

"Donnerwetter," I ejaculated, for before us stood the largest specimen of *Thelocactus tricolor* that I had ever seen.

When we looked about there were no more cacti to

be seen. But where one is, there should be others in the vicinity, and w began to search the other side of the hill with great zeal. A narrow arroyo lay between us and the next range of hills, and there on the slopes were hundreds of plants of *Thelocactus tricolor,* lighting it like the red glow of a sunset in the western sky. My friend gave a jubilant shout, and in the next minute we were rushing toward them, anticipating our reward for the many privations we had endured. A few hours later we had collected these rosy wonders and had them neatly packed into two bundles. We were no longer tired, our eyes sparkled, and I now looked defiantly at the glittering sun.

We reached camp late in the evening. In spite of tormenting thirst we were happy. We broke camp early the next morning, and it was high time that we did so. We were down to one canteen full of dirty water, and the rest of the moisture in the Pool of Jabali was divided among our burros. After several hours we arrived again at the place where we had left the bundles of *Thelocactus* on the day previous. Suddenly, my friend bent over.

"Look here," he roared.

I looked. Wonderful! There was a *Coryphantha werdermannii,* almost unrecognizable, because of the way it mimicked the ground surrounding it. Our eyes searched the ground around us, and we discovered several more of these rare cacti. My spirits went sky high. I was too excited to rest. I noticed my friend looking at me with the utmost amazement. Finally he grinned understandingly.

By the following noon we had collected and packed about 200 specimens of this most beautiful *Coryphantha* and secured them on our burros. We were now beginning to get the reaction from our long period of thirst. We had consumed our last water that morning. Almost fifty miles are between us and the next watering place.

"Still two days to go, and without water," my friend said, in a dull tone of voice. My mouth was completely dry, and my gums were shrunken. Before us the horizon shimmered in the heat. Panic-stricken we drove our burros on, far into the night. Then we stopped to rest. Erich was growing weaker, and I could feel myself getting feverish. We were exhausted, but our mounting thirst would not let us sleep. Our faces and lips were torn, and my swollen gums were rough and dry.

Shortly after midnight we started on again. Packing our animals hastily, we drove them forward. We realized too that Autumn had finally arrived. I had nearly frozen under my covers. However, the movement soon warmed us, and with the coming of daylight I was troubled with an insane thirst again.

By afternoon we were staggering, rather than walking on. However, I was still able to notice that the skies were clouded; I also knew with certainty that we were not leading the burros any longer, rather, they were leading us. I was almost insane with thirst. Erich wanted to stop and rest, but I always forced him up again. We had to go ahead if we wanted to survive. My brain was still functioning, though somewhat weakly. I knew from earlier experiences that we had to keep on the march. Somehow, I now noticed that it was becoming darker. I thought to myself that we were probably on the verge of cracking up, and that my vision was going.

"Damnation! I will kill one of the burros. Its blood will take us to the next water hole," croaked my friend hoarsely.

I only nodded, for it was apparent that we could go no farther. The indifference that comes when one has reached the limit of his energy is dangerous, but when that limit is passed man loses the power of rational thought entirely. Erich had reached that limit. There was a dangerous gleam in his eye as he took the rifle out of the pack.

Just then something happened that drove all thought of killing the burro out of our minds. Suddenly, and without warning, it began to hail. Hail-stones the size of pigeon eggs pelted down on us. I tore the rain coats out of the pack, threw them over the burros and we crawled underneath. In about fifteen minutes the hailstorm had passed. The ground was covered with several inches of hail. The sky did not clear, but grew darker and darker. However, that did not bother us. We were only aware of the fact that we had been saved. In a moment we had filled all of our containers with hailstones. I searched out all of the paper scraps that we had, lit a fire and began melting the hailstones. In a few minutes we had the precious water and were drinking it in competition with the burros. The persistent, dry pain in our throats gradually eased. My cracked lips and face did not burn so much. Erich looked at me happily. We arranged the packs on the burros and again started out.

We had taken only a few steps when a heavy rain started. However, we continued to travel, happy in the thought that we were still alive. Ah, how beautiful is life when one has been on the verge of dying from thirst. Soon we were soaking wet; night had fallen and we were very tired, so we stopped. We took the packs off the burros and arranged the raincoats on top of them for a shelter. It was a very damp camp, but we were asleep immediately. However, we had to go on again before midnight. I never noticed the chill of Autumn more than on this occasion. Nearly frozen, and stiff from the cold, we arose, packed our burros and pushed them on in the darkness. The rain had stopped, though the surroundings were still dripping.

Daybreak came as we reached the edge of the country which had been wet by the storm. Here we found firewood, so we stopped for a proper camp. The burros were unpacked again, and this time we staked them out. Erich set up the camp while I built a fire. In a few minutes we were warm again, had eaten and had drunk our fill of water. Completely fatigued we stretched out on the ground. . . .

Toward noon I awoke. Erich was still asleep, so I shook him vigorously. The sun was at the zenith, and once again was throwing the full force of its hot rays at us. My friend had a bad dream.

"Verdammt! I was dreaming that we were in Hell," he murmured, as comprehension of the surroundings showed again in his face. He took the canteen and drank in large gulps. Then, reaching the canteen to me he said,

"Drink! What a wonderful flavor!"

I do not know which death is the easier, to die of thirst or to freeze. Both are frightful.

In conclusion, I should like to give my cactus friends a question to answer. I had suggested to my companion that I tell the people who would get the cacti something of our experiences in collecting them.

"What we have done is unbelievable," replied Erich.

"At the last moment we found the long searched for *Coryphantha werdermannii* and *Thelocactus tricolor,* and at the very same spot we passed twice through the lips of death."

"Tell our cactus friend something of our experiences in getting these cacti?" My friend only grins contemptuously at such an idea.

Is he right? What do my cactus friends think of this story.

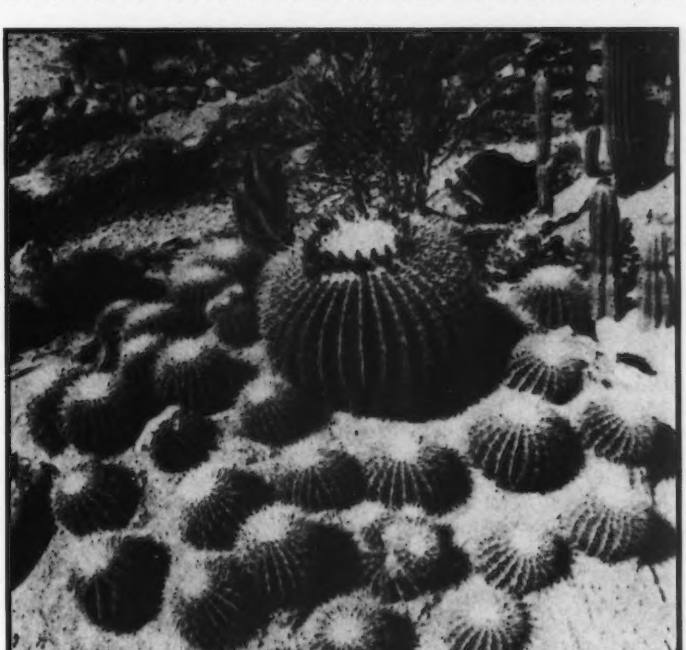

FIG. 18. A spectacular arrangement of golden *Echinocactus grusonii* in the author's garden in Canada.

LIME AND ITS FUNCTIONS

By LOUIS E. BLANCHARD, A.B., M.D., F.R.H.S.

Chemically speaking, lime refers to only one compound—*Calcium oxide* (CaO). The same term, agriculturally, has a more inclusive meaning and refers to all compounds of *calcium* and *magnesium* that can raise the pH of a soil by neutralizing acids.

Calcium, an integral element of lime, is indispensable to life. Deficiency diseases result, when it becomes a limiting factor. Plants require various minerals for their physiological activities, but calcium is definitely the most essential.

Limestone is the main source of commercial lime production. It is very abundant, and many mountain ranges and other sedimentary land formations are composed of this material. Marl is a mixture of limestone and clay. This bog lime is found in some swamps and lakes, where it was carried by drainage in its soluble form (calcium bicarbonate) and later yielded the insoluble calcium carbonate through the biological activities of plants and shell-forming animals. Other sources of lime are blast furnace slag, wood ashes, and certain industrial by-products. Wood ashes may contain up to 50 per cent of lime. Gympsum, a *dihydrate of calcium sulphate* ($CaSO_4 \cdot 2\ H_2O$), is called land plaster. It is formed in the manufacture of *superphosphate,* when crushed, insoluble *tricalcium phosphate* or *rock phosphate* ($Ca_3(PO_4)_2$) is treated with sulfuric acid (H_2SO_4). This produces the soluble *monocalcium phosphate* ($Ca(H_2PO_4)_2$) and *calcium sulfate* ($CaSO_4$).

$Ca_3(PO_4)_2 + 2\ H_2SO_4 \rightarrow Ca(H_2PO_4)_2 + 2CaSO_4$

The mixture of these products is known as *superphosphate.*

Pulverized dolomitic limestone (agricultural lime) contains about 80 per cent *calcium carbonate* ($CaCO_3$) and 14 per cent *magnesium carbonate* ($MgCO_3$). Other calcium compounds in use are the oxides and hydroxides. *Calcium oxide* (CaO) is known as *burned lime* or *quicklime.* This product is caustic and difficult to handle. It is produced by decomposing limestone (calcium and magnesium carbonate) in a kiln; *carbon dioxide* (CO_2) is driven off, leav-

ing the oxides of calcium and magnesium (CaO and MgO).

$$CaCO_3 + \text{heat} \rightarrow CaO + CO_2\uparrow$$
$$MgCO_3 + \text{heat} \rightarrow MgO + CO_2\uparrow$$

Calcium hydroxide ($Ca(OH)_2$) and *magnesium hydroxide* ($Mg(OH)_2$) are known as slaked lime. This is produced by the addition of water to *burned lime.*

$$CaO \text{ and } MgO + 2\ H_2O \rightarrow Ca(OH)_2 + Mg(OH)_2$$

These oxides have a strong affinity for water and generate much heat with a vigorous exothermic chemical reaction. They may also be slowly air-slaked by the absorption of moisture from the air. These hydroxides have mild basic properties. Calcium hydroxide is very sparingly soluble in water and its solubility diminishes with the rise of the solvent temperature. This solution, known as *lime-water,* is frequently used in medicine because of its basic properties. Mortar is composed of calcium hydroxide, sand, and water. On exposure to air, the water evaporates and the mortar "sets." This hardening process is due to the reaction of *carbon dioxide* (CO_2) in the air on the *calcium hydroxide* ($Ca(OH)_2$), forming water (H_2O) and crystals of *calcium carbonate* ($CaCO_3$).

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3\downarrow + H_2O\uparrow$$

Pulverized limestone is the *agricultural lime* that is most extensively used; it is non-caustic and easily handled. Its functions in the soil are multiple and complex. It is generally used as a soil amendment to neutralize acids; to render inert compounds readily available; to precipitate toxic salts; and to maintain an adequate *base-exchange* capacity in the soil colloids. As it is essential to cell formation, it must be considered a nutrient when applied to calcium deficient soils. Because of this vital morphogenetic effect, no growth is possible where it becomes a deficiency factor. The formation of calcium pectate in the root hairs of plants, enables this hydrophilic colloid to imbibe water; this substance is also credited with the function of an intercellular cementing material. When excessive organic acids are produced in cellular metabolism, such acidity may be neutralized by calcium.

Lime has a stimulating effect on the soil bacteria and enzymic processes involved in the formation and decomposition of humus. It provides favorable conditions for the biological processes of the symbiotic and non-symbiotic nitrogen-fixing bacteria; it enable special bacteria to oxidize the sulfur in complex insoluble organic compounds into simple SO_4^{--} ions, in which form the sulfur becomes available to plants. The formation of calcium soaps and calcium proteinates are important in maintaining semipermeable membranes in plant cells. Calcium is also believe to influence the translocation of carbohydrates in the starch-sugar changes. It is also essential in regulating the acid-base balance in plant tissues. Calcium oxalate crystals (very insoluble compounds) are produced in plants by the reaction of calcium and oxalic acid. It functions also as a preventive against plant diseases from parasitic soil organisms that occur only in acid soils. The high calcium content of plants improves its nutritive value as an animal food. It is indispensable in dental, skeletal, and shell development; it also has recently been shown to be essential in cell division.

The leguminous crops respond actively to liming, as the bacteria that fix atmospheric nitrogen in their nodules require calcium for their biological activities. Such crops leave nitrogenous residues in the soil that readily decompose under favorable conditions and produce humus and available nitrogen for the nonlegumes in the rotation of crops. Ample calcium in the soil, in the presence of organic colloidal materials, maintains an important high *base-exchange* capacity; it also make the soil loose and friable through its influence on the soil colloids. This provides better drainage, improved aeration, and favorable temperature. A soil in such *flocculation* is kept in good tilth with a minimum of labor. This benefit is largely due to biotic activities associated with the decomposition of organic matter and the synthesis of humus. Fertilizers are most effective when applied to such well conditioned soil. The conversion of organic nitrogen in manures and organic fertilizers, to available inorganic nitrates is accelerated by the presence of calcium.

Hydrolysis is significant in the use of certain calcium salts, where no increase in pH is desired. It is associated with the *ion-product constant* for water. Although we generally consider water as an *un-ionized compound,* there are cases where even its extremely slight *dissociation* of about two molecules per billion, has great significance. Water is a *neutral solution* with a pH value (hydrogen ion concentration) of 7. For practical purposes, we may assume that this represents one ten-millionth of a gram of H^+ ions in a liter of water. The hydroxyl ions (OH^- ions) and the hydrogen ions (H^+ ions) at neutrality are equal and represent a *constant. Acidity* is associated with excess hydrogen ions, and *alkalinity* with excess hydroxyl ions. The slight *dissociation* of pure water into charged ions may be expressed by the reversible equation,

$$H_2O \rightleftharpoons H^+ + OH^-$$

Through the action of hydrolysis, it is possible to add certain calcium salts in the soils of acid-tolerant plants without raising the pH value; these actually increase the acidity. Gypsum (calcium sulfate) and calcium chloride, although normal salts, become *acid-forming*

compounds by hydrolysis.

$$(Ca^{++}+SO_4^{--})+(2H^+ + 2OH^-) \rightleftharpoons 2H^+ + SO_4^{--} + Ca(OH)_2$$

The calcium sulfate unites with water to yield sulfuric acid and calcium hydroxide. Calcium hydroxide is a *weak* base and therefore only slightly ionizes; the sulfuric acid is *strong,* ionizes freely, and produces many hydrogen ions (H^-ions). The soil-water will have excess hydrogen ions and the pH will indicate *acidity*; yet the quantity of soluble lime has been increased. In *hydrolysis,* a *salt* and *water,* in a limited way, react to form an *acid* and a *base.* If the acid and base are *both strong* or *both weak,* the opposing ions produced are present in equal numbers and the solution is *neutral.* Thus, the hydrolysis of NaCl (sodium chloride), produces NaOH (sodium hydroxide) and HCl (hydrochloric acid)—*both strong;* the reaction is *neutral.*

$$(Na^+ + Cl^-) + H^+ + OH^- \rightleftharpoons Na^+ + OH^- + H^+ + Cl^-$$

When hydrolysis produces a *strong* base and a *weak* acid, the OH^-ions will be in excess, and the solution will be *basic* in reaction. Such compounds are known as *base-forming* salts. Sodium carbonate by *hydrolysis* produces sodium hydroxide which is *strong,* and carbonic acid which is *weak;* the solution is therefore *basic (alkaline).* Ammonium sulfate hydrolizes, to *weak* ammonium hydroxide and *strong* sulfuric acid; the solution is therefore *acidic* in reaction.

Phosphorus deficiency may be due to lack of phosphates in the soil, or its presence in unavailable compounds. In strongly acid soils (pH^4—pH^5), the soluble phosphates of added manures and fertilizers may be rendered unavailable by conversion to insoluble compounds. Such conditions can be corrected by the proper use of lime to bring the pH within the range of 5.6 to 6.5.

Gypsum ($CaSO^4$) may be used on black alkali soils to convert soluble sodium carbonate (Na_2CO_3) to insoluble calcium carbonate ($CaCO_3$) and the less toxic sodium sulfate (Na_2SO_4), thereby reducing damage from excess soluble salts.

$$CaSO_4 + Na_2CO_3 \rightarrow CaCO_3 \downarrow + Na_2SO_4$$

Gypsum acts as a preservative in manure by converting volatile ammonia to stable ammonium sulfate.

Active nutrients in a soil solution exist in an ionic state. Thus, the sodium nitrate molecule, $NaNO_3$, dissociates into Na^+ and NO_3^- ions. The *ionic exchange* between the soil solution and root hairs does not necessarily result in the absorption of these ions in equal proportions. Absorption of an ion in excess of another of opposite charge may take place. If Na^+ ions from sodium nitrate are absorbed in excess, other cations, such as K^+, Mg^{++}, or Ca^{++} may be released from the root hairs. The same procedure takes place with negatively charged ions. Thus, NO_3^- (nitrate)ions may be exchanged for HCO_3^- (bicarbonate) ions from the plant. The respiratory production of carbon dioxide in the roots may be of major importance in mineral absorption. Thus, growing root tips in contact with a marble slab will etch tracings of their growth because of the solvent effect of carbonic acid on lime salts.

A particular ion may accelerate or retard the absorption of another ion. The presence of Ca^{++} (calcium) reduces the absorption of Na^+, K^+ or Mg^{++}. This physiological process is known as *antagonism.* As a rule, an ion of one charge lessens the rate of absorption of another ion of similar charge and enhances the rate of absorption of an oppositely charged ion. The absorption of any particular ion does not depend upon its specific concentration, but rather on the *ratio* of its concentration. The antagonism is greatest when the proportions of nutrients in the soil solution are most unbalanced. For this reason, solutions of single salts are toxic to plant and animal cells. Such solution causes the replacement of multiple bases from the protein colloidal system with the predomination of one type of protein salt. This cellular environment is deleterious to the plant. Marine plants succumb in a solution of *sodium chloride* (NaCl) of the same or lower concentration as that existing in sea water. They will, however, survive in such solutions when another salt, such as *calcium chloride* ($CaCl_2$) is added in small amounts. When two salts that are individually toxic are placed in solution in appropriate amounts, their injurious properties are mitigated or vanish. This condition is known as *mutual antagonism.* When a solution contains various essential salts in proper proportions to show no toxicity, it is known as a *balanced solution.* The proper ratios of mineral salts in a complete fertilizer are essential in maintaining balance. Absorption of nutrients beyond the adequate amounts may result in toxicity, or represent a waste by luxury consumption without increased crop production.

The presence of a toxic ion, such as Cu^{++} (copper), will cause injury to a plant unless its absorption can be retarded. The specific antidote for such toxicity is calcium. The displacement of a toxic ion, such as Cu^{++}, by a nontoxic ion like Ca^{++}, alleviates the injury. To obtain the maximum benefit in such *antagonism,* the Ca^{++} ions must be present in sufficient concentration to markedly depress the absorption or accumulation of the toxic Cu^{++} ions. Inasmuch as calcium is an essential ingredient in cell structure, it is a specific antidote in such pathology.

The replacement of calcium by any other

cation would produce irreversible injury to the plant cells, as calcium is an integral ingredient of the protoplasm. In greenhouses, sodium selenate (a pesticide) is frequently applied to the soil. Excessive applications of sodium selenate may have its toxicity antidoted by the addition of calcium salts. The toxicity of a salt, such as NaCl (sodium chloride), may be caused, in part, by excessive removal of essential calcium from plants.

In the absence of antagonistic ions, extremely low concentration of ions of heavy metals, such as lead, copper, or zinc is very toxic to plant cells. A few parts per million of copper sulfate will rapidly kill algae. Ordinary distilled water is toxic to plants because it is not absolutely *pure.* It usually is contaminated with ions of copper, zinc, or lead derived from contact with the storage containers or from distilling apparatus. Although the concentration of such contaminants is extremely low, it may kill certain types of plant cells in a few minutes. Without the interference of *antagonistic* ions, such toxic ions are rapidly absorbed by the cells and combine with the protoplasmic proteins, which then are precipitated. Such denatured proteins may also be due to the release of essential ions in this slight ionic exchange. The lack of an essential element in the protein of the cell protoplasm would immediately denature the protein molecule. This is further complicated by damaging osmotic concentrations, which may hasten cell destruction in distilled water.

Although calcium is biologically indispensable, certain plants such as *Azaleas, Blueberries, Rhododendrons,* and epiphytic species of cacti require only small amounts of the basic elements for optimum growth. Since acidity and lack of bases in the colloidal soil complex show definite relationship, such plants tolerate acid soils for their biotic activities. Most crops have their optimum response at a pH value of 6.0—6.5, which is slightly on the acid side of the pH scale. If the pH is too high, toward *alkalinity,* certain micro-nutrient elements, such as iron, zinc, manganese, copper, and boron become unavailable. If the pH is too low, toward *acidity,* phosphorus becomes locked into insoluble compounds, and toxic amounts of soluble aluminum and iron may be released. Plants may even be unable to assimilate calcium itself as a result of overliming, because of the formation of insoluble carbonates and phosphates of calcium and magnesium at strongly alkaline reactions. The proper use of lime may solve many cultural problems, but there is also a risk of its abuse, and it should not be regarded as a panacea.

Plants grow in a wide range of soil reactions; some tolerate a pH value as low as 4.5 (very strongly acid), and others as high as 8.5 (alkaline). The soil pH value has only an indirect effect on the plants' growth, because of its action on the compounds from which the plants derive their nutrients. The pH *value* represents the *degree* of *dissociation* in solution, of an acid or base into its component ions. It does *not* imply *any alteration* in the *quantity* of the material involved. Plants may thrive in any physiological pH value at which the essential nutrients are available, and toxins are either absent or precipitated. Inasmuch as the proportions of nutrient requirements of plants are variable, the optimum growth will take place at that particular pH value which best provides their needs. Most plants require ample calcium, and since its phosphate compounds are in available forms in a slightly acid medium, a pH of 6.0—6.5 is best suited for growth. At this reaction, the ions show increased availability because of the *greater exchange-capacity* associated with the concentration of exchangable ions. Conversely, as the concentration of nutrients decreases, the availability is increasingly difficult because of the lowered *exchange-capacity.* The chief significance of soil reactions is its relationship to the availability of nutrients. The use of descriptive plant terms, such as *acid-loving* and *lime-loving* may be misleading.

Lime is indispensable in modifying soil conditions; it plays a vital role in plant physiology; it is essential for optimum fertility and productivity.

SUMMARY

Limstone is one of the most abundant substances in nature. In its pulverized form, it is known as *agricultural lime,* which is largely *calcium carbonate* ($CaCO_3$). As a soil amendment, it neutralizes acids, renders inert compounds available, and precipitates toxic salts. It acts as a direct and indirect fertilizer; it maintains a high *base-exchange* capacity in the soil colloids; it neutralizes excessive organic acids in cellular metabolism. Calcium has a stimulating effect on the beneficial soil bacteria and the enzymic processes involved in the formation and decomposition of humus. Through assimilation, calcium becomes an integral part of the cell anatomy, and it improves the nutritive value of plants which are consumed as animal foods. Lime is a preventive against parasitic soil organisms that thrive in acid soils; it hastens the conversion of organic nitrogen to available inorganic nitrates. Calcium acts as a general antidote in the *ion-antagonism* of toxic salts. Lime improves soil structure by making it porous and granular, thereby facilitating aeration and drainage. Calcium is also believed to influence the translocation of carbohydrates in the starch-sugar changes. It is a vital aid to soil fertility and productivity.

MADAME GANNA WALSKA'S GARDEN

Photos by CHARLES REDLER

One of the outstanding cactus gardens of the West is in Santa Barbara on the estate of Madame Ganna Walska. Continuing in the fine tradition of the Wright Garden, there are several hundred varieties of cacti, most of which are mature specimens of imposing size. There are also extensive mass plantings of succulents of all of the main groups; but the main effort has been with the cactus collection, which is truly magnificent. The pictures show a small part of one of the borders planted with Cactus, Euphorbias and Agaves. Fig. 20 shows a portion of the house. In the foreground is an assortment of *Echinocactus grusonii* and *Agave* spp. In the middle distances are *Pachycereus pringlei, Cereus* spp. and *Trichocereus terscheckii.* Toward the rear are *Euphorbia ingens, Lemaireocereus pruinosis, L. dumortieri,* and several others. Note the *Pachycereus marginatus* higher than the house.

There are nearly two acres planted in cacti and succulents in this close arrangement. In addition, the garden contains many extensive plantings of succulents, ferns, epiphyllums, cycads, palms and tropical foliage plants.

FIG. 20. Cacti as a foreground planting.

FIG. 19. The larger picture shows a bed of Ferocacti in the foreground which contains almost all of the known species. In the background is a collection of Carnegias of varying sizes, together with some of the taller Ferocacti and *Trichocereus terscheckii.*

FIGS. 21 and 22. Two views of a flower, x 0.7, taken in the morning after the perianth had well begun its closing motion.

PILOCEREUS POLYGONUS—NEW TO CUBA

By HOMER G. RUSH *and* E. YALE DAWSON

While botanizing in Cuba in the spring of 1949 the junior author came upon two examples of a *Pilocereus* of candelabra form growing on a brush-covered hill just west of Holguin, Oriente Province. Since the plant appeared unlike either of the other Pilocerei known from Cuba, *P. robinii* and *P. brooksianus,* a terminal branch cutting was taken for cultivation in the garden of the senior author in Los Angeles, California. In 1950 the cutting produced one flower and in October, 1951, four flowers. These revealed its apparent identity with *Pilocereus polygonus* (Lamarck) Schumann of Hispaniola (*Cephalocereus* of Britton and Rose). As *Cactus polygonus* Lamarck (1783), it was one of the first cacti described from the Caribbean region. Despite centuries of botanical exploration in Cuba, the occurrence of this species has apparently been overlooked[1], doubtless because of the small number of individuals and its interior localization. It apparently occupies a habitat similar to that in the dry parts of the adjacent island of Hispaniola to which it has previously been thought to be confined.

[1]A recent communication from Hermano Leon of Havana indicates that he once collected it, but neither identified nor reported it.

In adding this species to the flora of Cuba it seems well to give a description of the Cuban specimen and to present some illustrations. Flowering material of this species seems not to have been figured since Plumier's Plantarum Americanorum (1755-60).

Plants erect, 2-3 meters tall, light, dull gray-green in color, unbranched or with 2-3 long branches from well above the base, about 9-10 cm. in diameter in mid-parts, tapering to 6 cm. at the top; ribs about 9, 2.0-2.4 cm. deep, somewhat asymmetrical in flowering parts, with more ribs on the sterile side than on the fertile; areoles closely spaced, 10-14 mm. apart; spines on flowering branches 16-20, acicular, 10-14 mm. (or to 20 mm.) long, all alike, erect to spreading, dull straw-colored; pseudocephalia on upper parts of plants, unilateral, consisting of about 4 ribs bearing non-confluent wool-tufts in the areoles; pseudocephalia wool fine, yellowish at first, turning white, silky, usually not exceeding 2 cm. in length, borne in young areoles as well as flowering ones, these dense areolar tufts not completely obscuring the spines; flowers nocturnal, opening completely before midnight and beginning to close by dawn, 6.5 cm. long when open, 1.5 cm. in diameter at the ovary,

about 4.5 cm. across the open face; ovary, tube and perianth brownish green without; ovary naked; tube naked except for 2-3 very small scales without spines or wool; outer perianth segments thick, fleshy, lanceolate; inner perianth segments thinner, white, broadly lanceolate, about 18-20 mm. long, strongly reflexed at maximum expansion of the flower, more or less marginally fimbriate; anthers yellow; stigma cream-colored, extending well beyond the reflexed perianth; fruit not seen.

By manner of its hairy flowering areoles and naked flowers this plant is typical of *Pilocereus* Lemaire, emend. Berger.

FIG. 23. A branch-tip of *Pilocereus polygonus* showing unilateral pseudocephalium and young flower bud.

"SO YA WANNA GROW CACTUS"

By WM. MASTRANGEL

Rocking Horse Cactus Gardens

Continued from page 4, last issue

PART 2—WATERING

In growing cacti, the next most important factor after proper soil—is watering. Cacti and succulents can be killed by both over watering and not enough water; however, it is safer to administer less water, than more water.

Watering will depend also upon the type of soil used. Some cacti which grow well in tight, clay type soils, need less water than those which are grown in porous soils. Of course, as was mentioned in part one of the series, we know that most cacti do better in loose soil. In considering this, it is well to remember that the more porous the soil the quicker it will dry out. Climatic conditions will also have a direct bearing on this particular condition. We find therefore, that in damp climates where either fog or humidity is very often present in the atmosphere, one may water less often than in drier climates, where dry winds and plenty of sunshine dry out the soils. Another condition governing watering is the amount of rocks, shade, and proximity to boulders and fences. In outside gardens, we find that where soil has plenty of large stones, that the latter have a tendency to hold more moisture than in a soil made up of finely granulated material. Also in shaded areas near trees, boulders, brick or wood fences, etc., plants dry out less often than in open areas.

There are two successful ways to water—one, by a sprinkler attached to a hose and watering by hand, and two—by irrigating into shallow ditches between your plants. Irrigating does the job well but watering with a hose by hand is sometimes done haphazardly. The thing to remember in hand watering is to feed enough water to reach the bottom roots. One can be sure of this by going over the bed at least twice.

Watering indoor cacti requires more care than the watering of out door cacti. First of all, dish gardens and bowls which have no drainage must be carefully watered so that there is no flooding. For these types of bowls, ascertain the proper amount of water to dampen just to the bottom, so that soil is not saturated. Next, for pots with drainage, give just enough water so that there will be no run off through the drainage hole. Over-watering pots in this matter just needlessly drains out all the good in the soil. The general rule for watering house plants is—approximately twice a week during the late spring and summer season, and once a month in the late fall and winter (dormant season). Never let house grown cacti get too dry.

Certain types of cacti thrive in lots of moisture—a few examples: *Op. elata, Echinopsis* (Easter Lily Cactus), and others. Then there are certain types which do not care for much moisture such as *Peniocereus greggii,* Ferocacti, Astrophytums and others. Then too, the tropicals—Epiphyllums, Zygocacti and many of the night-blooming cereus, like a damp soil, especially in their growing season. Therefore in arranging your cactus garden, bowls or dish gardens, it is well to keep those types of cacti which prefer the same amount of water together. For example: *Astrophytum, E. grusonii,* heavy *Cereus, Ferocactus, Peniocereus greggii, Trichocereus,* etc., can be well grouped together in the drier bed. These plants should have water however—but being desert types, they are well able to stand longer periods between watering. The following group can be well watered—*Echinopsis, Rebutia, Notocactus, Gymnocalycium* (Chin Cactus), certain *Echinocereus, Chamaecereus silvestrii* (Peanut Cactus), etc. The large group of Mammillarias differ in their water requisition—some, like *Mam. bocasana* and *Mam. elongata,* require particular care in watering; and others such as *Mam. dolichothele* and *Mam. vaupelli,* are not too fussy and will drink what you give them. A good general rule, is to keep a watchful eye on your plants and if certain species want to rot out, you can almost be certain that they have been overwatered.

Another thing which has been mentioned many times in the past is to re-water when the soil becomes almost dry. The best test is to plunge your finger into the soil and if very little dampness is felt, it is the time to re-water.

The following are a few general rules to follow in watering plants outside:

(1) First, be sure soil is loose and well drained so that in watering, the water will not stand on the soil, but will start to sink in almost immediately.

(2) Water regularly and often in growing season, approximately twice per week, unless there is rain, drizzle, or excessive dampness, in which case reduce the watering periods.

(3) Do not wait to water until soil is completely dry. Rewater when you feel only a slight dampness with your finger about two inches below the soil.

(4) Irrigating wets the soil more completely than does sprinkling. With irrigation, there may be a longer period between waterings.

(5) In case of uncertainty as to whether or not you should water, it is best not to. Wait a little longer and be on the safe side. If a rain is expected, do not water or the cacti will be bogged down in mud.

(6) In cold weather, cacti hate wet feet. Do not water on cold days, also do not water in full afternoon sun. The best time to water is in the early morning or evening.

(7) Water plants in pots with just enough to reach bottom, or immerse the pot in a pan of water for bottom watering and remove same as soon as dampness shows on the top of the soil.

(8) Certain delicate plants as *Ariocarpus* (Split Rocks), and small Astrophytums, which have a tendency to water-rot, should be planted with a half inch of sand just below the base of the plant. This will drain the dampness away from the plant and keep it in a good condition.

(9) If your water is excessively hard, it will be best to add a small amount of water softener to the watering can. If water is too soft, add a little powdered garden lime to the watering can two or three times a year.

Finally, seventy-five per cent of your success in raising cacti, is in the proper soil, and care in watering and don't forget that flowers come only after a good winter rest; which means to stop growth by giving very little water in the dormant winter period.

Next issue "Light and Sunshine."

* * *

FROM LESLEY LOVE, AUSTRALIA

The Lands Department will soon make an appeal to householders in Queensland to destroy all types of prickly pear or cactus they are growing.

The appeal will follow the introduction to Parliament of a Bill, providing a £50 penalty for any person found guilty of selling cactus of the prickly pear type.

The Lands Minister (Mr. Foley) said last night that private persons who possessed cactus either in pot plants or in gardens would not be penalized under the Bill.

He told Parliament that almost any city florist was at present selling dangerous prickly pear as pot plants. The Bill aimed at stopping this.

Introducing the Bill to Parliament on Tuesday, Mr. Foley said that prickly pear spread by a single cactus pot plant to the Collinsville area would cost more than £150,000 to clear.

ROUND ROBIN NEWS

Before I tell you about the progress we have made I should like to clear up a misconception of the Robins. I have heard that a few of you think that because the JOURNAL is "technical" most likely the Robins are also and for that reason you are skeptical about joining them. Let me ask you this question. If you were introduced to a small group of people and in the conversation that followed you discovered that these people were all cactus-minded, wouldn't you be keen in your interest in the subject? Maybe one person divulged his "trick" in getting a certain kind of cactus to bloom, another might tell of his success in grafting plants and you might know of a place where a rare plant could be obtained. When you parted, wouldn't you wish that the group would get together again soon to continue the fascinating subject? Well, that is how simple a Robin is. It is not "text-bookish" at all but friendly and informative. As for the JOURNAL being "technical," aren't you grateful for the goal that is set for us by its high standards? I am sure that articles from the readers would be most acceptable to the Editor and they would be very interesting contributions to our JOURNAL.

Are any of you wondering just what a Robin is like? You may never have been in one and hesitate about taking a plunge into something you do not know much about. While I was mulling over this possible problem, I received a letter from a JOURNAL subscriber with a helpful solution. He asked me if I had ever considered having "Look See" members. That is, giving anyone who requests it, a look at any Robin for one round only. No obligation to join but an opportunity to look it over and then if he wished to participate he would apply for membership in one of the Robins. This could be arranged and it sounds like a good idea.

I have done everything I can think of to get you cactus fans together except to "hop" a plane and go out and get you, but don't be surprised if you should open your door sometime to find a lady outside with notebook and pencil in her hand asking, "Which Robin do you want to join?"

Now, to hear about the progress our Robins are making. Cactus and Succulent R. R. No. 5 has flapped its wings and started out under the able guidance of Mr. Lewis Valachovis of Johnstown, New York. In his group are: Mrs. John G. Butler, New Hope, Alabama; Mrs. Paul Kann, Roswell, New Mexico; Mrs. H. E. Johansen, Askov, Minnesota; Mrs. H. Barratt and Mr. L. Dephoff, both of Auckland, New Zealand.

"Let's Exhibit" R. R. had a lively first round. This Robin does not have a membership of exhibitors only. Some have joined to get ideas in case a Hobby Show could be started in their community. Mrs. Elbert H. Major of Richmond, Michigan, wrote in her Robin letter: *"Why Exhibit?* It is natural, if one has grown a flower, plant, vegetable, or fruit, to enjoy showing it in competition with similar products grown by others. It is like a game of skill and has all the amusement and interest that comes from pitting oneself against others on more or less equal terms. There is a thrill in taking a prize in a show or at a County Fair, and the colored ribbons, often the only awards at amateur shows, are as highly regarded by many exhibitors as more valuable than prizes. An exhibitor meets many people who have the same interests and benefits from the friendliness and exchange of ideas."

Dish Garden R. R. seems well liked and it is flying promptly. By the way, its members and the director, Mrs. Schaefer of South Charleston, West Virginia, got their heads together and decided on a different name so now it is "The Desert Dish Garden" R. R.

I received a good letter from Mr. Gilbert Taylor of Beaver, Oklahoma. He is joining the Mammillaria group. In 1947 he built a greenhouse for his collection in Mangum, Oklahoma. He has very few mature cacti in it that haven't flowered and for the past three years he has had a cactus in bloom every day. He says that the cactus group that make this possible are the Mammillarias. Sometimes only one or two of them are in bloom and then again there may be as many as 30 flowering at the same time. His work takes him over a wide stretch of Beaver County and he writes that he sees cacti among the house plants growing on the porches or in the windows of the farmhouses. He writes that he can't enjoy his collection to the fullest because his greenhouse is 205 miles away and he can only get in a week end with them every three or four weeks. When I read that part of his letter I made a resolution never to feel discouraged or disappointed if my little plants didn't bloom when I thought they should, realizing how close my collection is—just a few steps into three rooms and there they are! What sacrifices some cactus-lovers make for even a few days with their beloved plants!

Mrs. Nipper of Chester, Illinois, asked in her Robin letter whether anyone used Sedums in a button garden. One of the most attractive button gardens she had ever seen was made by the Chester Cactus Club members, using budded Sedums which opened their tiny flowers and looked beautiful for over a month. This dish garden was made for a member who wasn't feeling up to par and I think she must have enjoyed having such a dainty little garden by her side to admire.

Membership is available in the following four Robins: Cactus and Succulent No. 6, Mammillarias, Echeverias and Haworthias. And here is a brand new suggestion—a Robin for *Men Only*. It isn't so strange, for men have their own Garden Clubs so why not a Robin of their own! I have three members so far. What about more of you to join it! A postal will do and you will be promptly placed on the list.

I could go on chatting with you indefinitely but time and space puts a check on any more. Your letters are so interesting I wish I could include all of them. Until next time, happy flying!

MABEL H. FAY
123 North Avenue N. Abington, Massachusetts.

* * *

The Joshua Tree (*Yucca brevifolia*) propagates in two ways, by means of seed and by sending out long underground runners. The young plants which spring from the runners form the home ground of a remarkable butterfly, *Megathymus yuccae navajo,* nowhere else will she lay her eggs. When the larvae hatch they industriously bore into the young plant and follow it to the large underground stems where they feed and later pupate. This smart butterfly seems to know that a seedling can offer no such future to her children and in some uncanny way she knows which it is—a distinction a man cannot make without uprooting the plants. LADISLAUS CUTAK.

ADVICE

DO feed your plants, DO not try those old starvation methods.

DO give your plants, pots large enough to grow in. DO not expect them to show their beauty in tiny pots and scorched by the sun.

DO repot them, if you can every year. The color of the spines will be sufficient to reward you for your labour.

Do not say the other man has green fingers. The truth is, he is kind to his plants and above all; he respects life and gives it its dues. Neglect to all forms of life, has one reward—distortion and death.

PRINCIPLES OF PLANT REPRODUCTION

By R. C. PROCTOR

PART IV

Continued from page 28, Vol. XXIV, No. 1

A very faint odor can be detected in some day-blooming cactus flowers but it doesn't seem to be present along with the brilliant colors. Evidently, the bright colored flowers need no fragrance to lure the insects . . . whereas the night-blooming flowers must put forth a strong alluring fragrance to attract them in the dark. Colors are not necessary to nocturnal cactus flowers because they could not be distinguished in the dark. But white, in the light of the moon, be it ever so dim, is an aid to the insect in finding the flower. The slight tinges of color in some nocturnal cactus flowers is there, probbably, in anticipation of day-flying insects where the flowers remain open a good part of the day—and then their fragrance is not so strong or is often completely absent. It may be noticed that the few, colored, nocturnal cactus flowers are exposed to more daylight than dark, under natural conditions, and are not strictly night-blooming types after all; many day-blooming types also remain open all night.

There are multitudes of insects and multitudes of flowers, therefore the devices for cross-pollination are infinite in number, and cannot be dwelled upon here. But next to insect pollination, in scope and importance, comes the method of wind pollination which is worthy of our attention for a comparison:

Wind pollinated plants produce vast quantities of pollen—far more than the cacti and other insect pollinated plants, for the wind is a waster of pollen. Sometimes as much as a thousand pollen grains is produced by a wind pollinated flower for every ovule to be fertilized. Such flowers appear before the plant's foliage, are inconspicuous, individually, and usually have no pronounced petals.

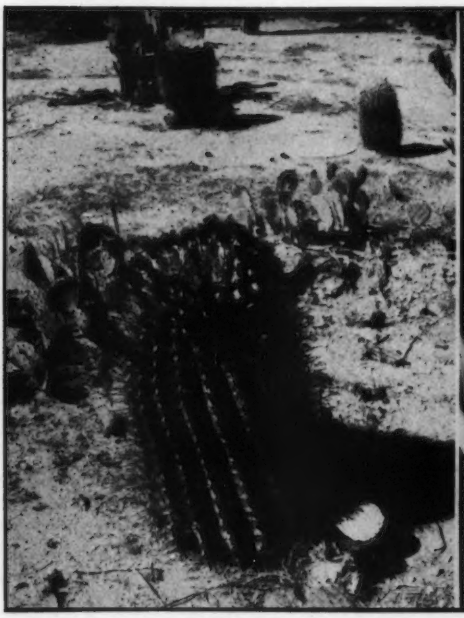

FIG. 24

Ferocactus Covillei. A fruit for every flower, and every fruit is 100 per cent filled with fertile seeds, because every condition favorable for the flower and seed process is present. The crown of fruits are most abundant on south side as were the flowers.

FIG. 25

Ferocactus Covillei fruit and seeds. No blanks were found in this bacth, because plenty of insects attended to pollination and the plant was accustomed to having one side exposed to the sun for many years. And, of course, proper soil, food and water balance was maintained.

About ten-thousand species of flowering plants (angiosperms) and all the naked-seed plants (gymnosperms) are pollinated by the wind. Of course, a few types of insects visit a great many of these flowers and thus contribute to their process of fertilization. The elms, a few of the maples, the ashes, alder, spicebrush and hazelnut are a few of the better known wind pollinated plants. Most wind pollinated flowers, especially those of trees and shrubs, are unisexual.

Some of the most harmful "hay fever" plants, that cause nose and throat irritation are elm, oak, poplar, timothy, walnut, cedar, corn, oat, pigweed, ragweed and wormwood, according to *The Story of Plants* by John Ash, and these are all wind pollinated plants. Wind pollinated species abound in locations exposed to the wind, or they grow close together (which cacti do not) in great numbers, like the grasses which form extensive stands where the wind has a free sweep. The flowers of many trees being high above the ground are exposed to the wind and are thus wind pollinated.

Insect pollination is more economical because the insects, particularly bees, ordinarily visit only flowers of the same species and their variations during a daily flight . . . therefore, the pollen grains are nearly always delivered to appropriate stigmas although the pollen is not produced in large quantities but a good amount of pollen reaches a stigma at the same time. There is also greater surety of cross-pollination where different plants are involved, especially where the various plants of a given species are scattered or isolated which is very much the case with cacti on the deserts of America.

Most flowers that are pollinated by day flying insects display bright showy colors and emit little or no scent. This is particularly true of cactus flowers. Those that are pollinated at night are usually white or, at most, pale pink or yellow but they do emit a very pronounced fragrance even though it cannot always be detected by some human beings.

Hybridizers have developed a wide range of bright colors out of the white-flowered Epiphyllums, that bloom at night, crossed with appropriate, colorful, day-blooming cacti. This has been done by hand cross-pollination and the recrossing of the subsequent generation until perfection in flower color and other desirabilities was achieved.

Flowering Cacti in Cultivation

The problem of inducing cacti, especially the desert types, to flower and develop fruit in cultivation has never been thoroughly understood by some amateur horticulturists. Or if it is understood they simply neglect to give their plants that special care that is essential to flower and fruit development. In fact this writer is guilty of such neglect and if the plants refuse to flower I do nothing to coddle them because I'm not too fond of work. But many more flowers are possible than a lot of cactus collectors realize.

The chief headache for a lot of us is in the buds. While they may erupt as expected—the plant having active daughter cells—they do not grow into full flowers, or they fall from the plant. Then if they do reach the flower stage and are properly cross-pollinated, the hoped for seeds often fail to materialize. But even if all turns out well—flowers, fruit and new plants from such—the plants, in many cases, never flower again. Often when a newly acquired plant does flower it is because the buds were set before it was removed from its natural habitat or its long time home in a dealer's garden; hence the new owner gets one crop of flowers but new buds fail to develop.

Most of this trouble can be laid to moving the plants in cultivation which disturbs their adjustment to their customary source of light . . . if they were ever left in one position long enough to become adjusted. No sooner than the metabolism of a plant becomes geared to the light being on one side then it is shifted to some other position and has to start all over again to adjust its cell structure to a proper relation to the light from another side. Let us hope that some day dealers will be able to indicate which side of a plant that is sold to us is accustomed to the south or sunny side—or lighted side.

The entire life processes of the more rigid stemmed desert cacti are adjusted by long years of exposure of one side to the south or sunny side—north of the equator, of course. Hence the flower and seed mechanisms are never thrown out of kilter by a sudden change of exposure to the source of light; and there is an abundance of flowers and seeds on the wild cacti. But when the wild cactus is removed to a garden, even in Arizona, and if it is not planted with regards to its customary position in the sunlight, it may never produce flowers after the buds that were previously set have bloomed out. And in many instances, to my own sorrow, many well developed buds have fallen from a plant that was carelessly replanted after its long life on the desert, or in a dealer's plant house.

Rarely do haphazardly replanted cacti of the columnar and spherical types readjust their metabolism here in the hot desert country, and to a lesser degree in temperate zones, and when they do show healthy growth and flowers it is probably because of the accidental positioning of the plants in their customary posture.

It would therefore seem that when cacti in cultivation must, of necessity, be moved about, the side accustomed to the sun or other source of light (or should be accustomed) should be exposed to the new source of light such as the window, open door, or the open and lighted side of the porch. If there was no definite source and the light was equal on all sides at all times these precautions would not be necessary. The lopsided development of flowering plants is perfectly natural; they do that on the desert where the source of light is on the south side except the very middle of summer or perhaps on the north side below the equator. This phenomenon is due to phototropism (and dehydration of one side, to a certain extent) a subject worthy of more study then can be devoted to it here.

The best advice for growers in temperate zones who desire flowers is offered by H. M. Roan, in his book, *Cactus and Other Succulent Plants,* on page 18; from which I quote:

"Do not judge the value of a plant entirely by its size. Plants that are grown correctly, with every condition to flower properly, are often smaller than those forced by excessive heat and too much water. These latter are not likely to flower at all. Being grown so rapidly they are sensitive to changes in temperature and general treatment, have a much lessened resistance to disease and, after reaching their new owner, readily collapse and die. . . . Judge the plant after you have given it a chance to flower. The sturdy and steady development of these plants depends on correct growth from seed to maturity. . . . Give your plants their proper rest and they will respond to your treatment."

And on page 39, Mr. Roan correctly advises: " . . . but do not turn any plants which have developed flower buds until after the flowers have opened. The lopsided development can often be prevented by holding up the plant with a wire."

So . . . when you get right down to the fine points in cactus culture, growing plants is one thing but growing them for flowers and seeds, away from their native habitats, is quite another; a specialty that involves considerable knowledge of cactus plants and their principles of reproduction. Anyone sufficiently interested can acquire such knowledge, and the *proper* plants for his particular facilities to gain experience. The types of plants, local environments, and the amount of effort one is willing to expend are the chief factors to be considered where the production of cactus flowers is the object in view.

It has been said that nothing is impossible and there are always any and some cacti that can be induced to put forth flowers and seeds in any locality if the grower is able to give them the necessary attention—and lives long enough for some of the slow-growing kinds.

A CACTUS COLLECTOR IN THE ANDES

An account of a second expedition to the west coast of South America.

By HARRY JOHNSON

In the early months of 1948 I visited Peru, Ecuador and Columbia to study the desert flora of our sister republics. When one thinks of South American he is quite probably visualizing the vast jungles of the Amazonian basin or the towering peaks of the Andes. Seldom does one realize that these are but facets of a complex geography and fall far short of the reality. This first expedition was to become acquainted with the various countries of the west coast and to see at first hand what regions would most surely repay closer investigation. After a reconnaissance covering the main vegetational belts from southern Peru to central Columbia I had a reasonable picture of where to expect to find members of the Cactaceae. Some three months were thus pleasantly spent collecting, photographing and getting the worst of arguments with chauffeurs. Several new cacti were found and introduced.

On the way home we stopped in Panama where we found *Hylocereus,* and a longer stop was made in Guatemala where during 1919-20 my wife and I had spent a couple of years. I visited again, after a lapse of twenty years, our old home at Coban. How changed things were! It then took a solid week of travel by boat, train and horseback to reach this isolated town while now one can fly there in an hour or so. However, we went by car so that we might collect along the way and found several interesting cacti near Salama. *Melocactus Maxonii, Lemaireocereus longispinus, L. pruinosus* planted as a hedge plant and for its edible fruit, *Acanthocereus horridus.* Higher in the mountains which separate the desert-like Salama region from the rainforests of the Alta Verapaz grew *Epiphyllum guatemalense* and *Hylocereus guatemalensis.* A fine succulent small tree was *Plumeria* or

Frangipani with lovely trusses of white and yellow, very fragrant blossoms. It grew here amongst the pine trees, the branches leafless but each tipped with the handsome blossoms. Another fine succulent was a member of the Wandering Jew family, Commeliniaceae, the plant like an *Echeveria* with a terminal spike of soft pink blossoms. A very nice small *Agave* grew here also. At the crest of the mountains one passed suddenly from a xerophytic scrub forest of oaks and pines to the dense dripping green of the rain forest. One could almost throw a baseball from one to the other. These sudden transitions from wet to dry while startling to the uninitiated are not too infrequent. Much depends upon the lay of the land which deflects the prevailing winds.

Returning to Guatemala City we flew to Merida in Yucatan to see the Maya ruins of Chichen Itza passing over hundreds of miles of potential cactus country where the forests were thin and the land dry. At the ruins I collected *Selenicereus Donkelaari* bringing back one plant found growing on the lip of the platform from which the priests threw the girls, chosen each year as sacrifices, to their death in the cool green waters of the cenote. *Cephalocereus Gaumeri* grew in this locality. A slender plant 5 to 10 feet tall with few branches. An *Acanthocereus* was quite common, a form of *A. pentagonus*. I saw some tall tree cacti but could not stop to collect them.

In September, 1951, I had my plans laid for an expedition to Peru. However, I first stopped over in Ecuador to meet and talk over plans for future work with my very good friend Dr. Misael Acosta S. He is a remarkable man whose great enthusiasm and unflagging zeal has brought around him a fine set of earnest young scientists and capable administrators who are fleshing out a bold program for the natural sciences. His country may well feel proud of him. Through his kindness I had the services of Mr. Giler to accompany me on two trips. One to the jungle country of the Rio Pastaza took us south past the snowy peak of Cotopaxi to Ambato where Chimbarazo rears its hoary head amongst the drifting clouds. Past the ruined town of Pelileo where the earthquake of 1949 shook the city flat leaving not a building standing. We dropped down to Puyo a fast growing frontier village now much larger than my last visit. Here we secured the services of Severino Vargas the chief of the local Jivaro Indians to take us into the jungle to find some Marantas I wanted. The Jivaros in the past were great head hunters, and still are, who shrunk human heads to the size of an orange for souvenirs. They are adept with the blowpipe, a nine foot tube with which they can puff or blow a dart a hundred feet with great accuracy and force. Severino, a very intelligent and capable man, knew at once where to go for the plants and as we went through the jungle pointed out and named scores of plants. He took us home and introduced us to his family, his two wives, his two grown sons and their wives and children and his younger children. He showed me how to use the blow pipe; the darts and curare poison—a spek of which will kill a man in a couple of minutes.

Back in Quito we left for Santo Domingo on the west side where I hoped to locate *Epiphyllum phyllanthus*. In the hot jungle lowlands these things look pretty hopeless but eventually near the town of Quininde I found two plants growing up some thirty feet high in a tree. The Colorado Indians live near here. They coat their hair with red wax and cut it in a mush-bowl bob which gives them a striking look. They paint themselves with blue stripes and wear a brilliant yellow or red manta over a shoulder. Peaceable now they are fast disappearing as cultivation claims their land.

I arrived in Lima on Sunday, October 7th, and the next day greeted Dr. Cesare Vargas C., professor of botany from the University of Cuzco who was to accompany me as assistant during the northern part of the expedition. I then proceeded to buy a small English car and on the 10th we started at 6 a.m. Our plan was to go into the Andes at two locations and then north and east to Jaen and the Rio Maranon. This would bring us into cactus country where no cactus collectors had really ever gone. Botanists generally do not pay too much attention to cacti, due in large measure to the great difficulty of preparing specimens and the paucity therefore of herbarium material for comparison. To really study cacti one must maintain a large living collection.

Our first objective was Huaraz, an old city in the valley of the Rio Santa one of the few streams running north and south which eventually reach the Pacific. Perhaps an explanation of the topography of Peru is in order. In Bolivia the Andes split into two ranges as they go north. The western chain forms the continental divide. All water east of it goes to the Atlantic. East of this divide is a jumbled mass of mountains and high plains called "puno" cut by deep river valleys generally running north and south. The puno averages from 12,000 feet to 15,000 feet, mostly about 14,000 feet. Between the Andes and the ocean is a plain broken by mountains and cut by valleys which runs from Ecuador south into Chile. In the south it is higher and more broken. This coastal plain is dry and often completely devoid of plant life except for

the strange bromeliads which lie, often rootless, on the sand. Though this coastal strip is practically rainless except toward the north the southern portion, where high enough, comes within the cloud or fog belt which blows in from the Humboldt Current. Within this area are the famed "cloud gardens" of Peru. None of Peru has excessively high temperatures although all of it is well within the Tropic of Capricorne. Lima, the largest city and in the middle on the coast, is only 12 degrees from the equator with average temperatures of about 72 degrees F. The Andean peaks, of which there are many, reach heights of over 22,000 feet. East of the Andes lie the Peruvian lowland jungles, a vast area with little contact with the rest of Peru and almost unknown. Its rivers reach the Amazon and on its frontiers are Ecuador, Colombia, Brazil and Bolivia.

To change climate in Peru one need not go north or south but simply up or down. A thousand feet may make a great change in temperature and a greater change in rainfall. Thus one can almost guess the elevation by the crops he sees growing.

On our way to Huaraz we went north along the coast. There is little to be seen as the region is very desert, broken only by a few "lomas" where billions of orange red bells of the charming Stenomesson bulbs may chance to be in bloom. At each of the small streams that come down from the flanking Andes is a small town at one of which we stopped for coffee and bread for breakfast. At Patavilca we turned up the valley of the Rio Fortaleza. At the mouth are great fields of sugar cane. As we began to get above large cultivation we saw our first cactus, a *Haageocereus* related to *H. multangularis*. Higher we saw more of it and also *Melocactus Townsendianus* and a new, as yet unpublished, *Armatocereus* provisionally named *A. armatus*. This is a distinct species with few very strict branches. It ranges to just south of Lima. The ever present *Neoraimondia macrostibas* is reasonably abundant.

For a very long space there were no cacti and then we discovered a most interesting prostrate *Borzicactus* with inch thick stems clambering amongst the rocks and scanty brush. The bright red, woolly flowers had reflexed perianth segments and were somewhat zygomorphic. The genus *Borzicactus* is an old one and of recent years the tendency has been to divide it into several genera. If it is divided at all it should be made into perhaps four or five. Backeberg has lopped off *Loxanthocereus* and *Clistanthocereus* and Akers' *Maritinocereus*. However, this cannot complete the list for there are other divergences. Perhaps we would be much more sensible to look for the likeness between the plants than their small differences for then our difficulties dissolve. Just that small change of emphasis will show true relationships much more convincingly than true differences. Since any grouping of plants must be arbitrary we must further discover that the smaller the groups become the more arbitrary the grouping becomes. This is inherent in the proposition for at first we are looking for similarities but later for differences which are always easy to find but whose taxonomic values are difficult to assess.

To be continued

QUESTIONS and ANSWERS

Conducted by
HARRY JOHNSON
Paramount, Calif.

Question: My cacti have been wintered in a cool basement. When should I take them out? Mrs. Charles Knight, Michigan.

Answer: This problem confronts us all in the spring. It cannot be answered with precise dates but one can judge the time within quite reasonable bounds for ones-self. I am never in a hurry to start plants into spring growth until the weather is well past the flurries of early spring. It should be remembered that the active growing period of most cacti does not extend over the whole spring and summer. They are not annuals which must make their entire growth, flower and mature their seed within the span of spring and summer. In the wilds the plants regularly make only a few new areoles each year and spend the rest of the time maturing that growth and storing food for the next years flowers. If they are started too early they often become "drawn" due to lack of sunshine and to the fact that rooms are kept more or less closed during cold weather. Therefore wait till spring is well advanced so the plants will receive plenty of fresh air and the sun of longer days. They may be brought out perhaps a month earlier than this to slowly accustom them to the light. However, don't be in too much of a hurry for as long as they are dormant and resting they will be all right. Cacti are accustomed to long rest periods and their normal metabolism is geared to it.

Question: I have several species of *Rhipsalis* which I much admire but have often wondered under what conditions they grow in the tropics where they are found? Mr. R. M. Joyce, South Dakota.

Answer: Rhipsalis are native to many diverse regions but the greater number of them do come from within the tropics though I believe they have been found as far north as Florida. Generally they are true epiphytes and grow in trees though probably they would be just as happy growing on rocks or cliffs where their pendent habit would have free play. I have found them in quite dry regions but where there was considerable fog as the growth of accompanying bromeliads suggested. Again I have found them in warm regions with heavy seasonal rainfall. One new species I found was growing on the trunk of a tree cereus. Almost all true epiphytes are resentful of heavy, close soils so when mixing a potting soil for them be sure it is very open. They grow quite well in two parts sand to one part coarse leafmold. This mixture drains freely and there is not much danger of overwatering. Since they are so easy to grow and so charming when in bloom it is a wonder they are not more commonly seen. The flowers are small and generally white but they are often very floriferous. They vary greatly also in the shape of the branches. Some are flat and slender others expanded and often crisped, some are round, long and slender, others triangular or round and winged. One, *R. paradoxa,* has triangular stems which are reversed every couple of inches like the links of a chain. They may be grown as small plants and will flower thus, or as very large specimens in baskets where their pendent growth is shown to best advantage. They thrive under the same conditions as Orchid Cacti.

Question: Can you tell me the earliest flowering cacti? Leroy Adams, Kansas.

Answer: Perhaps the earliesct are certain of the Mammillarias as *M. Hahniana, M. Hamilton-Hoytae, M. elegans, M. Werdermanniana,* etc., which are in flower in February with many starting in January. Stenocacti of many species are in full bloom in February. Neoporterias are always quite early with us and are full of buds now. While none of the Echinocereus are yet in flower many are loaded with buds, one species in particular is the lovely *E. papillosus.* Echinopsis in many species are showing buds (February) though they will not open for some weeks yet. Some Rhipsalis are already past their flowering.

Questions:

(1) Can never make the mimicry plants live when I bring them in the house in the fall. They grow well during the summer outdoors.

(2) If cacti have not outgrown their pots in a couple of years and are making normal growth should they be repotted or is it better not to disturb the roots. Edith Butler, Pa.

Answers:

(1) Since, from your letter, you have done about everything for your plants that one could reasonably do I think the trouble may lie in the timing of the growing period. The natural growing season of the mimicry plants such as *Lithops, Dinteranthus, Titanopsis* and related genera is not our summer. We start them into growth in late August or September. After plumping up and slowly forming new feeding roots they proceed to flower. This happens between September and early November. From here on they grow very slowly until they have finished their growth in late spring. As growth is matured they get less and less water until the growing season arrives again. Our own experience is that summer is definitely their resting period. Put them under a pane of lightly shaded glass outside during summer. They will need very little water.

(2) If your plants are growing satisfactorily they certainly do not need repotting. Watering plants in pots regularly and applying fertilizers, eventually builds up within the soil residual chemicals which change soil textures and when critical concentrations are reached kill the feeding roots. For these reasons the common recommendation is to repot every two or three years.

FROM ANTWERP
(October)

I hope to have my greenhouse finished within a week, so that I may shed my plants till it begins to freeze, when I shall have to store them indoors. Winter is always a critical period for such plants in our region, because the weather and temperature varies so much, unless one has central heating, which is not the case with me.

I have made up a list of succulents which are winter hardy on condition that they are held as dry as possible. Are there, as far as you know, many other plants (succulents of course) which are winter hardy or do you think that my list contains plants which are not so? If you think that such a list may be of interest for the members of the Society, you could perhaps publish it in the Journal and I would find my answer in this way.

OPUNTIA: *rhodantha, camanchica* (*phaeacantha*), *fragilis, compressa* and *opuntia.*
ECHINOCEREUS: *Fendleri, viridiflorus, Engelmanii mojavensis, coccineus.*
CEPHALOCEREUS: *senilis.*
MAMMILLARIAE: *Coryphantha vivipara, Neobesseya missouriensis.*
SEDUM: *spectabile, Sieboldii, Kirilowii,* var. *rubrum.*

I have tried the "Vermiculite" for a couple of cuttings and I think really that it is a good rooting product. Next year, I am to try it for sowing some cacti and I am to make a special box which can be heated with an electrical bulb, so that constant heat may be secured.

I made a trip to Luxemburg a few weeks ago, and about all that I noted were Phyllocacti, one would think that it was a specialty of this country.

ALOIS DENGLER

FIG. 26. *Cactus oaxacensis* on Isla Iguana, Laguna Superior, Oax., Mexico.

CACTUS OAXACENSIS—CANDY CACTUS

(*Melocactus* Link and Otto)

"Biznaga" candy made from *C. oaxacensis* Br. & R. is a familiar sight at fiestas in the region of the Isthmus of Tehuantepec, Mexico. From "time immemorial" this cactus candy trade has been a regional monopoly of the small Zapotec town of Espinal near Juchitán. Following the customary Indian division of labor, men collect and bring in the "biznagas." Preparation of the candy I think may be a family job, but only women and girls sell it.

C. oaxacensis may be found widely distributed over the hot dry plains, and lower hills, on the Pacific slopes of the Isthmus. Nowhere have I found the plants in abundance, and those of commercial size are usually few and far between. The Pan-American highway opened up new sources of supply for the Espinaleños, and trucks from Oaxaca now bring in "biznagas." Whether these be *C. oaxacensis*—from Totolapan, or other parts in the upper Tehuantepec river valley—or of a different species, I have not yet ascertained. The habitat group (see Fig. 26) shows only small plants, and these not clearly, but is of interest in that it grows near

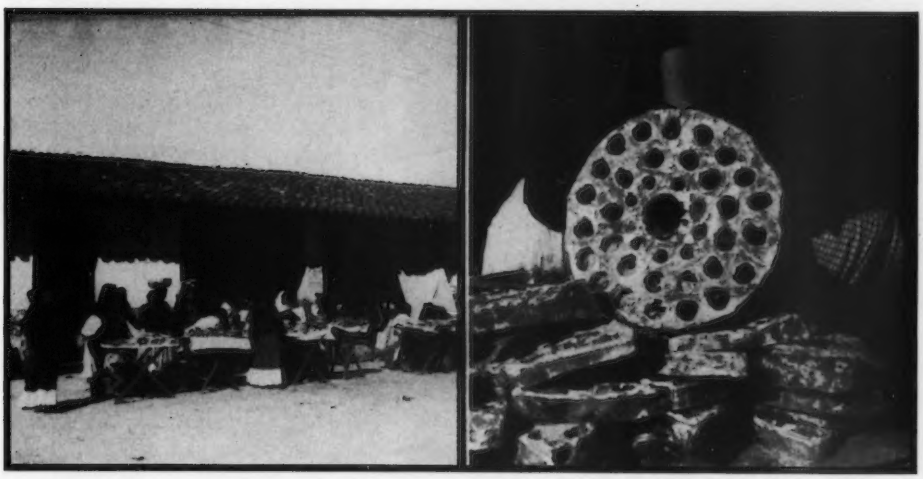

FIG. 27. (Left) Selling cactus candy at the New Year festivities in Tehuantepec, Oax., Mexico. FIG. 28 (Right) Candy made from *Cactus oaxacensis*.

the water edge on a small island, where it is exposed to salt spray. About four years ago we made an expedition to this and other islands, of the Laguna Superior. Rather fearful of being marooned there, we sampled the liquid in these sprayed "biznagas" and decided it was too saline—even for emergency use.

T. MACDOUGALL

FIG. 29 (Left) Illustration from Br. and R., Vol. III, Fig. 249, called "Cactus Sp." This photo was made by Prof. C. Conzatti in 1913 at Salina Cruz. FIG. 30. (Right) In Vol. IV, Appendix, Britton and Rose named this same plant *Cactus oaxacensis* as a new species. "Since 1914 C. R. Orcutt recports finding this plant at the same location and Dr. B. P. Reko sends us this photograph along with flowers and seeds. Dr. J. A. Purpus re-collected it in 1923 (type) and sent living plants."

FIG. 31. *Sclerocactus Whipplei* collected by Wm. Taylor Marshall in the Apache country.

IT'S CHEAPER TO BUY THEM

By R. C. PROCTOR

Some people believe that we Arizona collectors are living in a sort of cactus utopia where, by stepping off a few feet down our alleys, we can lift choice plants, fresh, right off the desert —free of cost. But every native cactus in my collection is a luxury item.

The fact is: we can buy Mexican, South American and, even, Arizona plants from local or out-of-state dealers for a fraction of what it costs to collect the native varieties.

In the first place, cacti, except for a few prickly pears, chollas and saguaros, are not growing wild within fifteen or twenty miles of Phoenix. And as more housing projects are getting underway on the outskirts of most of the towns, the cactus desert is rapidly receding. Which means

that longer trips must be made for the riffraff which we are accustomed to hauling in on holidays for the lack of something else to do.

The cheapest plant worth having from the Arizona desert is the *Mammillaria microcarpa,* or fishhook cactus. We can get them by driving eighteen miles (one way) on thirty-one cent gasoline tnd twenty-five dollar (per wheel) rubber. My time on off-from-work days isn't worth much but I figure the last trip the wife and I made, including depreciation on the car, cost us seventy cents for each of the microcarpas we collected.

That figure isn't so bad, indeed, and collectors who live right smack on the desert can gather *some* plants for much less . . . but only two, three or four different kinds that may be growing in their respective neighborhoods. They too must travel long distances at considerable expense and explore wide areas of desert land before any respectable assortment of plants can be acquired.

Food and lodging are items that add greatly to the costs of cactus hunting in Arizona when nights are spent away from home. This is usually the case when a long prowl over the hills and plains is necessary. For instance: my wife and I collected four rainbow cacti near Wilcox, two-hundred miles from home, that cost us $7.00 for a night's lodging, $12.00 for three meals, each, and $4.06 for gas; or a total of $23.06. A few days later we purchased a large, beautiful rainbow cactus with five buds on it from a Phoenix dealer . . . for one dollar.

Yes, sometimes we do bring in a large economy load consisting of everything that is spiny and portable. But not too long afterwards the excess and culls are carted back to the desert, for lack of space, at a cost of about 5.00 for transportation, or we may haul it to other collectors who live ten or twelve miles apart, hoping someone will take it off our hands—as a generous gift, of course.

Some people value their plants according to the price they pay for them, which, I suppose, is the practical way to feel about them. But if cost adds anything to a plant's social standing in a collection, I have one that's really an aristocrat. It's a *Sclerocactus.* The Mrs. and I drove 275 miles to Marble Canyon to look for some (some, mind you), and, after seven hours on the road, spent all the afternoon exploring the hot desert with nary a one in sight. The next morning we moved on up to Freedonia, 71 miles farther—not counting the side road trips—and finally, after ankling all over the landscape, we stumbled upon one lonesome plant. Here is a breakdown of its cost:

Two nights lodging	$14.00
Four meals, each	$16.00
Two cents a mile depreciation on the car	$14.00
Gasoline	$14.57
Oil change	$ 1.70
Bent fender repaired	$22.00
My trousers ripped, the work kind	$ 5.00
Lost, the Mrs. purse, no money in it	$20.00
Aspirin	$ .25
Total	$107.52

So don't envy us who live in Arizona where cacti are free (plus cost). It's cheaper and easier to get your plants from a dealer. Oh yes . . . , it's lots of fun collecting your own—sometimes—if you don't mind the price!

COLOR PHOTOGRAPHY

By A. MILLARD ARMSTRONG

(Lecture at the Denver Convention 1951)

If there are any expert photographers in the group, I am not speaking for their benefit. In the first place, in a half hour, I could not give a post-graduate course in advanced color photography. In the second place, an expert photographer knows more about the subject than I do. To the rest of you, if photography is your hobby, you have an interesting one. Maybe I am going against the rules, or what others have told you, when I say to keep it a hobby, and don't make work out of it. If photography is your life's work, then you should aim for perfection. But, if photography is one of your hobbies, if you work too hard at it, you will lose the zest and the fun that there is in it.

Maybe I could qualify as an expert on how NOT to take colored pictures. I think I have, at some time or other, committed most of the errors in the books. I still get a lot of fun out of it. I might tell you of the beautiful slides I took on the western slope in Colorado two years ago on the way to the Convention in Phoenix. I can't show you the slides—because with those 36 masterpieces, the film didn't go through the Leica. Or, I might tell you of the beautiful slides of a mother bear and her cubs in the Smokies—that time I left the lens cap on.

How good your pictures should be will partly be determined by the use you expect to make of your pictures. If you expect to take them for your own records, or your own amusement, and they satisfy you, that is all that is necessary. In this case, it doesn't make a lot of difference if there are errors in taking them, or if the color

is not exactly right. On the other hand, if you expect to show them to others, you should take more pains and you should try to learn more about the subject.

The reason for the necessity for greater exactness in exposure of color films is due to the complexity of the film and is due to the fact that a more involved and more complex procedure is necessary in the development of color films. Color films are actually three layers of different dyes which are coated on the film base. These dyes act in a similar way to filters in black and white photography. Thus, the blue dye passes blue light and holds back all other colors. The yellow dye holds back all but yellow. The difficulty is that actually, no suitable dye has been found that will perform its work to perfection—each dye permits some of other colors to pass through. Therefore, even with perfect exposure, it is entirely possible that the finished transparency may not be an actual representation of the true colors seen by the eye. It is even worse when the exposure isn't perfect.

Although the manufacturers keep a close check, color emulsions may vary slightly from time to time. Another reason why slides may differ is because there can be a variation in the development. Although it is true that usually, failures in colored slides are due to the photographer, if it will soothe your feelings, it is also true that sometimes the failure, or unsatisfactory slides, are due to the manufacturer or the processing laboratory.

One of the important things in color photography is exposure. The simplest means of determining this, although not necessarily the most satisfactory, is to read the instruction sheet which comes with your roll of color film. From this you will see that the basic exposure for the average subject and scenery is F 8 with 1/50 of a second. Other exposures are given for other conditions. As long as you take your pictures only on sunny days, you probably won't have too many difficulties without an exposure meter. However, if you expect to take pictures on cloudy days, or under adverse lighting conditions, an exposure meter is almost a "must." As an example, during what we ordinarily call a cloudy day, there may be at least 30 different intensities of light. In black and white photography, you can miss your exposure by at least two stops and still get a good picture. In color photography, your allowable margin of error is as small as a half a stop. However, don't think because you spend $25 or $30 for an exposure meter that you have fully solved all exposure problems. Even with a meter you still have to think and use some independent judgment, depending upon the type of subject you are taking. I might remind you that all pictures are taken not by the action of the light, but by the action of the light which is reflected from your subject. This is the reason that a person in dark clothing will require more exposure than one in light clothing, and the reason that desert scenes require less exposure than forest scenes.

Although it is somewhat elementary, and applies to black and white photography, as well as color photography, I might say that a "stop," or the "F" value of a lens is a system of measuring the amount of light transmitted by the lens. With a fast lens, the majority of pictures do not require the maximum light of the entire lens. By means of a diaphragm, the amount of light going through the lens is decreased. Each of the following F stops decrease by one-half the amount of light reaching the film:

F 2 - F 2.8 - F 4 - F 5.6 - F 8 - F 11 - F 16

The *smaller* the F number, indicates the greater amount of light being transmitted by the lens. Thus, with the aperture, or diaphragm, set at F 5.6, one half as much light reaches the film as at F 4.

The second method of varying the exposure is by varying the shutter speed. Thus, with 1/50 of a second, only one-half the amount of light reaches the film as at 1/25 of a second.

As an example, the exposure of 8 - and a shutter speed of 1/50 of a second, would be the same exposure as F 5.6 at 1/100 of a second. By decreasing the aperture to F 5.6, as much light passes through the lens, but the 1/100 of a second shutter speed only permits half the light to reach the film, so actually the exposure is the same in each case. Confusing, isn't it?

Composition is a word which to a dozen different people can mean a dozen different things. In photography, and in brief, it means placing the subject matter of your picture, so that it makes a pleasing picture. The next question logically is "what is a pleasing picture?" Here again, it is a matter of personal opinion and if it suits you and you only intend it for your own use, it has fulfilled its purpose. There are many rules in composition, all of which have been broken at one time or another by both photographers and artists. One of the simplest methods of increasing the composition of a picture is by means of framing. On scenic shots, this can be done by having trees at the side of the picture. It can be done by shadows or foreground subjects in the front of the picture.

The placement of the center of interest in a picture is also an important part of the composition of a picture. If you have one main subject of the picture, it should not be in the exact center of the picture. Such a position is less

pleasing than if the main subject of the picture is off-center.

One trouble with the average amateur photography is that the photographer thinks a scene or a flower garden is beautiful and attempts to capture the whole thing on his film. This seldom turns out satisfactorily. In viewing the scene or a garden, the person unconsciously notices only the most beautiful things about it and the distracting details are overlooked. The camera film cannot do this, but must record everything within the limits of its lens. As an example, a picture of an individual flower, or an individual bloom, is usually more satisfactory and more interesting than one of an entire garden. A picture of one mountain peak filling the frame is usually more interesting than a mountain range extending hundreds of miles.

These general remarks also apply to flower photography. Here again, the use to which the pictures will be put or the audience to whom they will be shown, will enter into the type of pictures you take. A photographer might look for beauty of color, or form, in a flower, and try to show this in his pictures. On the other hand, a botanist might be interested mainly in the rarity of the plant, or in other details which might not necessarily make a good picture to a photographer. In general, it is well to take a shot of your plant showing the entire plant and possibly showing the habitat of the plant. This, though, should be followed up with a close-up. As a rule, close-ups of only part of the plant, or the flower, make a much more interesting picture and a much more effective picture. Possibly some of the explanation of this is that as a rule we humans are not very observant and we glance at objects without actually seeing them.

In working for close-up pictures, it is usually necessary to stop down the lens in order to have a greater depth of focus in the picture. At the short distances usually required for close-up flower photography, the focus is very critical. That is, if you focus on the center of the flower at 10 or 12 inches, the stem or the petals of the flower which may be 14 or 15 inches from the lens would be out of focus at a large aperture. For this reason, it is usually advisable to stop down to F 16 or F 22 and give a longer exposure. One difficulty in the longer exposure is that if there is any breeze, there may be movement in your subject. This is one of the necessary evils which you will have to look for and try to guard against.

The background can be very important in flower photography. It may be either something unobtrusive, so as to show off the flower, or something dramatic to emphasize the beauty of the flower, or something spotty and distracting. The human brain is a wonderful thing, and with most of us, our brain has developed the habit of seeing only what it wants to see and disregarding everything else. If our nature is optimistic, we see the sun—if it is pessimistic, we see the shadows. If we want to concentrate on a flower, we do so—without actually seeing its surroundings or its disturbing background. Photographic film—whether black and white, or color, does not have this facility.

There are many things in color photography which I haven't mentioned. As in black and white photography, equipment is important in color photography; but it isn't as important as the person who is using the equipment. If you see me taking pictures, you might see me using considerable equipment, but this is because I'm lazy, and equipment is a help to a lazy person (until it becomes necessary to carry it around awhile). What camera or what equipment you use, is a matter of personal taste. However, master one camera or piece of equipment before trading it in or buying new equipment.

Another large subject which I haven't touched upon is color temperature. The intensity and color of light will vary with the light source. This is true with both artificial light and with sunlight. With artificial light, most of you are familiar with the difference in light with a fluorescent light and with a tungsten bulb. The same is true with the sun—depending on the position in the sky, it may be white. In early morning and late in the day, it may contain a lot of red. Color temperature is a measurement of light. Color films, when manufactured, are balanced for a certain specified color temperature—the one under which most people will be using that film.

* * *

TRAVELING FIELD COURSE

The Department of Botany of the University of Michigan will offer a traveling field course in Plant Taxonomy and Ecology during the summer session of 1952 (June 23 to August 16). Instructors and students will travel and camp through various parts of Indiana, Illinois, Missouri, Arkansas, Oklahoma, Texas, and New Mexico. The two month's course is outstanding for its practical, first-hand method of acquiring field experience. The plan is to travel by private busses and camp in the field. All facilities are included for the estimated cost of about $460. For further information write Dr. Pierra Dansereau, University of Michigan, Ann Arbor, Mich.

* * *

CEREUSLY SPEAKING: We regret that John E. C. Rodgers' page was received too late for publication. This is one of the most popular pages for the amateur and collector. It will appear in the May-June issue that will be mailed early in May. Many of our readers will want March-April cultural information before the next issue of the JOURNAL. If you will send a stamped, self-addressed envelope we will send you an advance galley proof.

FIG. 32. Cactomaniac's permanent planting at the Desert Botanical Garden in Arizona.

There IS Interest in Cacti

The 300 acre Desert Botanical Garden in Papago Park is demonstrating that the public is strongly interested in cacti and other desert plants. The first day of their Cactus Show (Feb. 17) clocked an attendance of more than 2500 people and it is expected that during the week the attendance may exceed 20,000. Situated near Phoenix, Arizona, it has a population of some 200,000 to draw from but the majority of visitors are winter tourists.

Since "Bill" Marshall, as his thousands of friends call him, assumed directorship six years ago he has expanded the facilities of the Garden and added some 15,000 plants. The Garden itself has made a remarkable comeback and the plantings of native trees, shrubs, and wild flowers furnish a natural environment for the ever increasing number of cacti and the other succulents.

There are many interesting plantings for testing certain theories. For example, a collection of *Opuntia erinacea* from Utah, Nevada, New Mexico, California, and Arizona shows forms with densely covered bristles from the Mojave Desert to almost nude and spiny variations; any single plant might be taken as a new species. Harry Johnson found this same situation among *Tephrocactus* (sub-genus of *Opuntia*) and brought back dozens of collected forms from South America. These collections should help to discourage our European friends from naming varieties as good species. To return to *Opuntia erinacea* in the Desert Botanical Garden—a specimen with white "hair" ten inches long is one of their most spectacular plants and the constant comment is, "It looks like a poodle dog," which is a much better common name than Grizzly Bear. The public was also intrigued by the crested forms and their comment was, "Looks like huge worms"!

The Garden has a "Self Conducted Nature Walk" with a printed pamphlet containing 54 explanations with corresponding numbers placed among groups of plants along the walks. When more than 500 individuals purchase these guides in one afternoon, it is a demonstration of the public's interest.

There is no admission charge and it is supported by its members and friends who subscribe to the *Saguaroland Bulletin* and take out a membership. Schools, colleges, study groups, botanists, and collectors receive generous aid, lectures, and advice from its tireless Director and his Chief Horticulturalist, Hubert Earle. A garden of this kind extends its influence over the entire world and is a meeting ground for all those interested in desert flora.

Desert Botanical Garden Cactus Show

Dr. Louis E. Blanchard, well-known JOURNAL contributor and collector from Canada, judged the recent show with the assistance of Scott Haselton. The outstanding exhibit was an out door planting of native Arizona cacti in a model garden by that active Phoenix group of collectors which call themselves the "Cactomaniacs;" here in one plot one can study all the native cacti with their variations. The dish gardens and arrangements were the most popular features of the indoor show; one corsage was beautifully done with single flowers of *Bryophyllum diagremontianum* placed within rosettes of a *Sedum* species and tied with delicate two-toned ribbons to harmonize. Mrs. Benson showed a series of cactus and desert wild flowers individually mounted within plastic blocks which were back lighted to show their natural colors; the perfection of these delicate specimens shows what might be done with flowers for herbariums and botanical studies. Another year this show will exhibit varations of cacti from the local deserts. To encourage even a better show next year the judges suggest:

1. Select plants without blemishes and no not mutilate specimen plants for arrangements.
2. The pot should be in proportion to the plant and in harmony. Do not plant too low in the pot.
3. All containers should be uniform and free from blemishes.
4. Select a few well grown plants rather than many ordinary plants.
5. Only rooted plants should be shown.
6. Suggest a classification for the rarest cactus and the rarest succulent in the show.
7. Arrangements should be featured because of their popularity.
8. In order to win a first ribbon the exhibit must be up to show standard and should not receive firsts just because there are no other entries.

Comment overheard at the show, "I identified my 12-inch plant at the Garfield Conservatory as a Saguaro. Why doesn't my plant flower?" The answer to this one is a display (No. 43 Desert Botanical Garden) which shows a row of *Carnegiea gigantea* juvenile plants from two to 24 inches tall with the following caption, "A group of young Seguaro from 3 to 40 years old will give you some idea of the slow rate of growth of this huge species in the first 100 years—which is the hardest for a Saguaro."

SPINE CHATS

LADISLAUS CUTAK

In my estimation, William Mastrangel of the Rocking Horse Cactus Gardens hit the nail right on the head in his article on Soil in the last issue of the CACTUS JOURNAL. I, too, fear that some of our cactus enthusiasts make their hobby too complicated to derive any enjoyment from it. These folks follow with meticulous care all the inconsequential formulas they read about and never seem to succeed with them. As Mastrangel puts it, "You got to absorb all suggestions and hints with a grain of salt." Propagation, culture and other routine work should be adjusted to as simple methods as possible. In regards to soil for most cacti and succulents there is no need to be too 'finicky' about it. Ordinary top soil mixed with leafmold and sand has been my standard formula for years. I suggest you read Mastrangel's article again and give it some thought.

* * *

The possibility of using steroidal sapogenins as a source for cortisone has been much discussed in recent years and possible first stages for partial synthesis have been investigated. Dr. Marker and his co-workers were the first to find the hormone in species of Agave, and investigation is still being carried on, but since they did not investigate the sisal plant, *Agave sisalana,* which is widely cultivated in East Africa, the Medical Research Council (London) examined this plant as a possible source of cortisone. The whole leaves have been found to contain *hecogenin,* considered a basis for the production of cortisone. Hecogenin can also be extracted from sisal waste, the short fibers and debris producing approximately the same amount as the useful fibers. The investigation is being continued in England as well as in East Africa.

* * *

In the latter part of 1951 three new species of *Epithelantha* were described in a Mexican publication. This brings to five the number of the Button Cactus. Two of the new ones were described by Dr. Helia Bravo Hollis and one by the late Carolina Schmoll in Anales del Instituto de Biologia (12; No. 1, 1951). All three species are from collections made in Coahuila. *Epithelantha spinosior* differs from the well known *E. micromeris* in being a larger plant with heavier and different colored spines; *E. densispina* in the number and disposition of the interlacing spines which completely hide the body of the plant; *E. rufispina* in the disposition, color and size of the spines. All of the five species are illustrated in the work.

* * *

One of our likeable young men, Paul Hutchison, is now in South America on an exploring trip for the University of California. At the Denver convention last July many of you got the opportunity to meet him but I'll attempt to tell you more about his background so you can get better acquainted. The plant bug bit him at eleven years when he won a house plant at a Catholic bazaar for a nickel. From this humble beginning he graduated from the more common house plants to cacti and succulents, especially the South African kinds. At his home in Antioch, California, he had at least a thousand species. As a State Scholar he entered University of California in 1942 but never had the opportunity to attend classes because he was called to active duty in the Navy—hospital corps—where he served for three years. On one of his leaves he visited St. Louis and had an opportunity to attend the fall Cactus Show of the Henry Shaw Cactus Society where I met him for the first time. After his release from the Navy Paul went back to school and took up Botany. In 1949 he accepted a position at the Botanical Garden of the University of California, Berkeley—where his duties consisted of caring for the succulent collection and gradually expanded into office work, clearing and systematizing the plant records. Every species and horticultural form will eventually be catalogued, accessioned with a number, and records kept both numerically and alphabetically. In July, 1950, he was officially appointed Junior Botanist to carry on research and writing as well as the regular routine work. The entire garden at the University is being mapped and new unit areas established. The Succulent garden has been rezoned by countries.

Although Hutchison's interest in Succulent plants is general, he seems to prefer the Haworthias, Gasterias, Echinofossulocacti, and Mammillarias. An enthusiasm for Haworthias in 1939 led him to his investigations of this fascinating genus, the accumulation of many plants, as well as material in manuscript form. He has no private collection at present as all of his plants were either given away or sold when he took over the position at the Botanical Garden of the University. His ambition is field studies in South Africa and as much field work on our Western Hemisphere succulents as possible. The latter he is now enjoying and we hope he will favor the CACTUS JOURNAL with accounts of his South American trip.

* * *

"Plants of Big Bend National Park" (announced in the last JOURNAL) is a new well illustrated paper cover book of 209 pages by W. B. McDougall and Omer E. Sperry which was published in late 1951. Big Bend National Park contains 707,895.45 acres, making it the sixth largest in the National Park System. The park is a land of contrasts and offers a rich flora, a conspicuous feature of the area. The book sells for One Dollar and can be obtained from the Government Printing Office in Washington, D.C. It is written in non-technical language and was primarily published to aid in identifying the various kinds of plants in the park. Four types of plant communities are located within the park—the most extensive being the Desert scrub. More than 800 species of plants are listed and described, including such xerophytes as 3 Agaves, 6 Yuccas, 1 Dasylirion, 1 Nolina, 4 Talinums, 1 Echeveria, 3 Sedums, 1 Villadia, 1 Euphorbia and 43 cacti.

* * *

Notes from a scrap book. The movie studios cleverly counterfeit coral and marine plants for undersea views. "When we found ocean stuff wouldn't transplant," said a Universal director, "we dipped *cactus* and other desert growth in a plaster solution. Dried and painted, this 'bottom of the sea' fooled everybody."

MOST POPULAR SCIENTIFIC TEXT

Part I of "The Morphology of Cacti" by Buxbaum, has met with such world-wide interest that the second part is now in production. There are about 200 drawings in this second section on the Flower with more original material than the first section which dealt with the Root and Stem of cacti. Part I is still available at $3.25 (net, no discount) and will probably be out of print when Part II is announced.

"CACTUS GROWING FOR BEGINNERS"

The fourth edition of this popular book by Vera Higgins contains chapters on Soil and Potting, Sun and Ventilation, Heating and Watering, Seed Raising, Cutting and Grafting, Types of Cacti, How to Make a Collection, Insect Pests, Succulents Other than Cacti, Miniature Gardens, etc. Postpaid $1.00.

BOOK REVIEW

WILD FLOWERS OF THE CAPE OF GOOD HOPE, by Elsie Garrett Rice and R. H. Compton; 24 pp. of text, 250 colored plates illustrating 444 species; issued in 1951 by The Botanical Society of South Africa, Kirstenbosch, Newlands, Cape Province, South Africa. £2/10/0.

Although not primarily concerned with succulents, this beautifully-illustrated work can be considered background material for properly understanding our own favorites in relation to their place in the general flora of South Africa. Here in color are many of the strange and gorgeous plants, mostly little known in our gardens, that one sees mentioned so often in accounts of African collecting trips: Brunias, with their red or white pom-poms; the Ericas, or heaths, long one of the floral treasures of the Union; the insect-eating Droseras and Utricularias with their surprisingly pretty flowers; the parasitic Harveyas and Hydnoras, the latter singling out *Euphorbia* as a host; the handsome silver-leaved Leucodendrons, and allied Proteas and Leucospermums with flowers like red pinecones; terrestrial orchids of the most amazing complexity and weirdness, outstanding examples being *Herschelia,* the "Begging Hand," whose tiny flowers resemble just that, *Bartholina* (the "Spider Orchid"), and the aristocrats of the group, the rare and difficult Disas.

These and a host of other genera, including *Watsonia, Lachenalia* and *Gladious,* rather convince one that South Africa has more than its share of wonderful flowers, and that the succulent-collector has a narrow, even distorted, conception of its variety.

But succulents are here too, many not previously figured, and a list of these follows: *Adromischus bolusii, Cotyledon grandiflora, C. orbiculata, Crassula capensis, C. pellucida, C. rupestris, Rochea coccinea, R. subulata, Vauanthes dichotoma* (a little-known crassulaceous plant), *Aizoon paniculatum, Carpanthea pomeridiana, Carpobrotus edulis, Cephalophyllum alstonii, C. anemoniflorum, Erepsia anceps, Lampranthus glaucus, L. filicaulis, Oscularia caulescens, Stapelia variegata, Euphorbia caput-medusae, E. mauritanica, Aloe saponaria, Bulbine asphodeloides.*

The plates are well-drawn and reproduced, and short descriptive and distributional notes are furnished for each plant. An excellent introduction by R. H. Compton deals with such matters as classification, habitats and conservation. MYRON KIMNACH.

Epiphyllum Handbook—Haselton....$3.85, postage 15c

Cacti for the Ameatur—Haselton .....$3.00, postage 15c

Succulents for the Amateur—Brown .....$3.00, postage 15c

Abbey Garden Press, 132 W. Union St., Pasadena, Calif.

WANTED: To know where one can buy a collection of Sempervivums. Cactus and Succulent Journal, 132 W. Union Street, Pasadena, California.

SPRING OFFERS

Opuntia Santa-rita (The Purple *Santa-rita*)—Large perfect pads .....75c ea.

Epithelantha micromeris (Button Cactus)—Full size specimens.....50c ea.

Astrophytum Virens (Green Star Cactus)—Large imported specimens.....$2.25 ea.

Gasteria pulchra (The beautiful Bow-tie).....75c ea.

Mammillaria ruberrima (The Ruby Ball)—Rare, fine specimens .....$1.75 ea.

Mammillaria spinosissima (Silver-haired Mammy) 75c ea.

Above specimens sent postpaid—cash with order. Minimum order—$2.00.

"World Famous"

ROCKING HORSE CACTUS GARDENS

2415 W. Glenrosa Phoenix, Arizona

FROM MEXICO

My new Cacti Price List of 1952 has just been finished. It contains a good number of new discoveries. If you really are interested in rare Cacti, just write for my list to:

FRITZ SCHWARZ

Apartado 347 San Luis Potosi, SLP Mexico

"ALOES OF SOUTH AFRICA" REDUCED TO $11.50

Because of the large sale in the USA the publishers in South Africa have allowed us a discount that we can pass on to purchasers. Those who have purchased a copy from us last year may write for a credit of $2.50. The monograph of 650 pages is one of the finest botanical books ever published and contains 572 illustrations and 75 beautiful color plates of Aloes in their natural habitat. Order a copy while it is still available; it will be a good investment in years to come. Copies will be mailed direct to you from South Africa for $11.50 postpaid or from stock in Pasadena plus 35c postage, foreign 60c. Sales in California please add 3% sales tax.

ABBEY GARDEN PRESS

132 West Union Street Pasadena 1, California